Integrating Science And Language For All Students With A Focus On English Language Learners

Brief 1 of 7

UNPACKING THE NEW YORK STATE P-12 SCIENCE LEARNING STANDARDS

Produced for the New York State Education Department by Okhee Lee, PhD

The New York State P-12 Science Learning Standards (NYS P-12 SLS) were adopted in December 2016, and implementation began in July 2017. As the first of our seven briefs, this brief unpacks the NYS P-12 SLS for all students, with a focus on English language learners (ELLs).

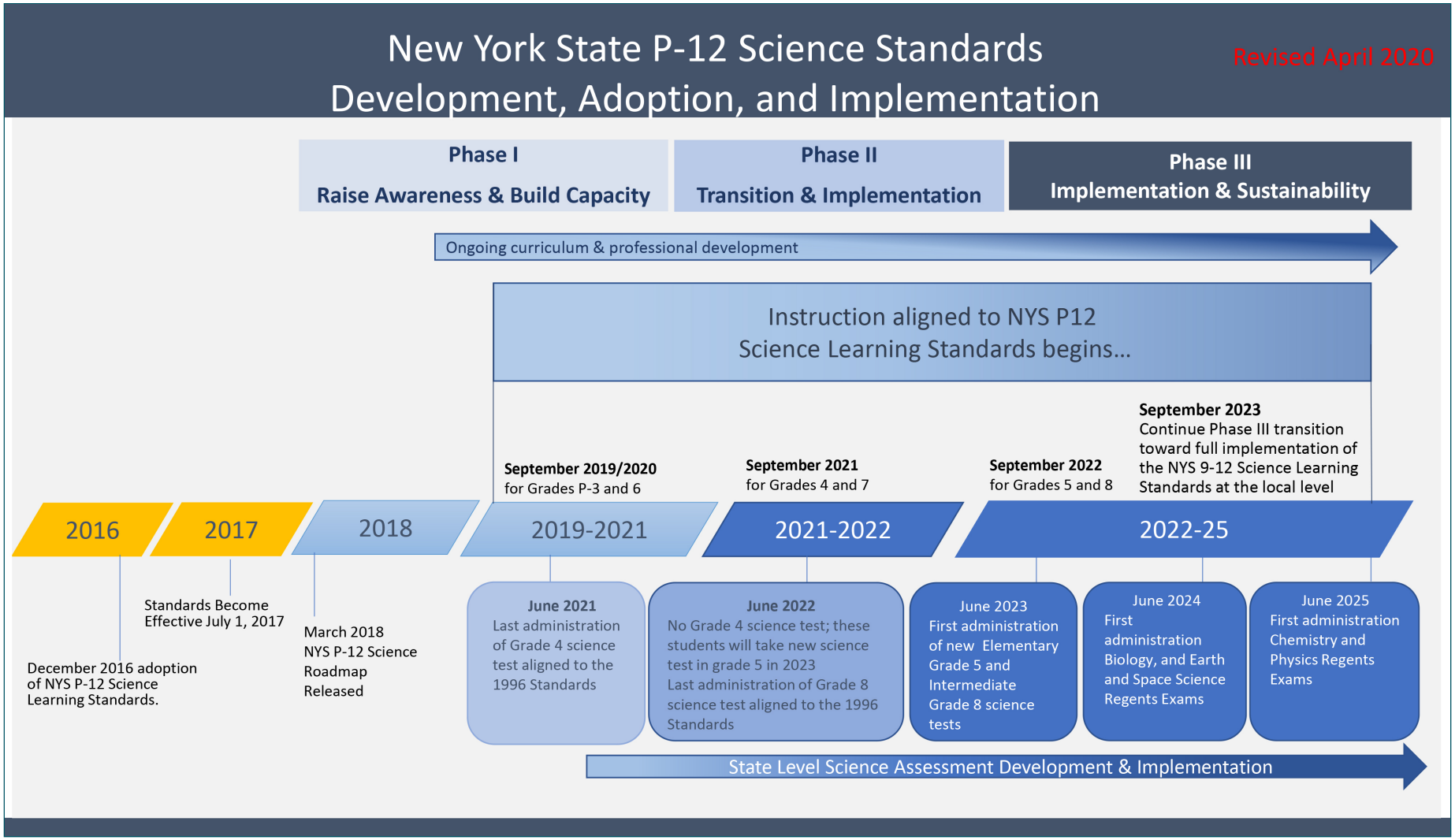
New York State P-12 Science Learning Standards in a National Context

The science education community has initiated three generations of science standards since the early 1990s. This historical context is important for both science education and ELL education communities. For the science education community, the three generations represent the community's consensus on what would count as science and what would be expected of science learning outcomes with P-12 students. The current science standards represent contemporary perspectives on what counts as science and how P-12 students learn science. For the ELL education community, which is lacking a history of consensus building, multiple generations of science standards would offer insights into the consensus building process over time. In addition, the Every Student Succeeds Act (ESSA) of 2015 mandates that English language proficiency standards be "aligned with the challenging State academic standards," including science standards.

Science education reform started with the publication of *Science for All Americans* in 1989, followed by *Benchmarks for Science Literacy* in 1993. These two documents established a general agreement on what counted as science in science disciplines and related disciplines and what school science curricula needed to address with K-12 students. Then, the *National Science Education Standards* published in 1996 provided the guidelines for K-12 science education. Most recently, *A Framework for K-12 Science Education* was published in 2012, which reflects advancements in contemporary science and our most current understanding of how K-12 students learn science. The Next Generation Science Standards (NGSS) released in 2013 were based on the *Framework*.

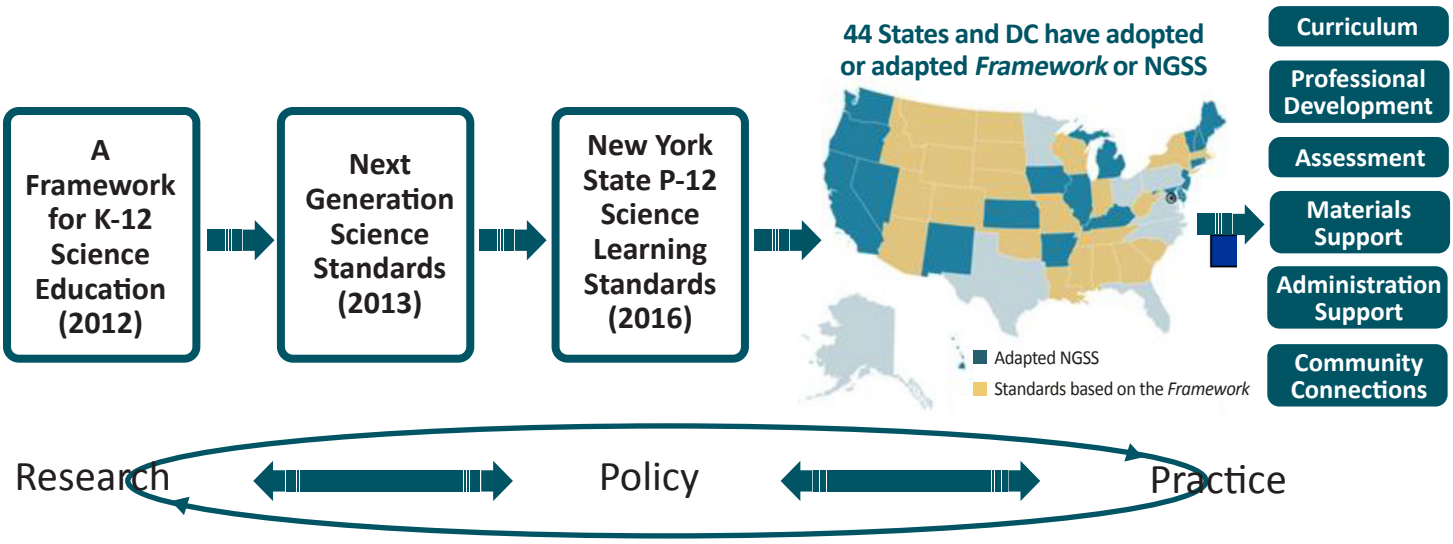
These multiple generations of science standards represent evolving definitions of what it means to "do science." Science process skills included observing, predicting, summarizing, reporting, and the like. These skills were often taught separately, with the expectation that students would learn to use the skills collectively. Hands-on science emphasized students' active engagement instead of memorizing science facts or vocabulary. Minds-on science was introduced to complement hands-on science that was debated for lacking cognitive engagement. The scientific method was typically described in the beginning of science textbooks. However, the notion of a single, linear, and unitary scientific method was debated. Science inquiry was emphasized as the core of science teaching and learning in the *National Science Education Standards*, but it was debated for being ill-defined and ambiguous. Science and engineering practices are used in the *Framework* and the NGSS to emphasize that students engage in science and engineering as scientists and engineers do in their professional work.

The NYS P-12 SLS are based on the *Framework* and the NGSS. Since the adoption of the NYS P-12 SLS in December 2016, the "Science Timeline" provides important milestones for transitions for instruction and curriculum, and targeted dates for the first administration of new assessments, including new Grade 5 and Grade 8 assessments for June 2023 and new Regents Exams for 2024 or 2025 (http://www.nysed.gov/common/nysed/files/programs/curriculum-instruction/science-timeline.pdf).



New York State P-12 Science Learning Standards for Diversity, Equity, and Inclusion

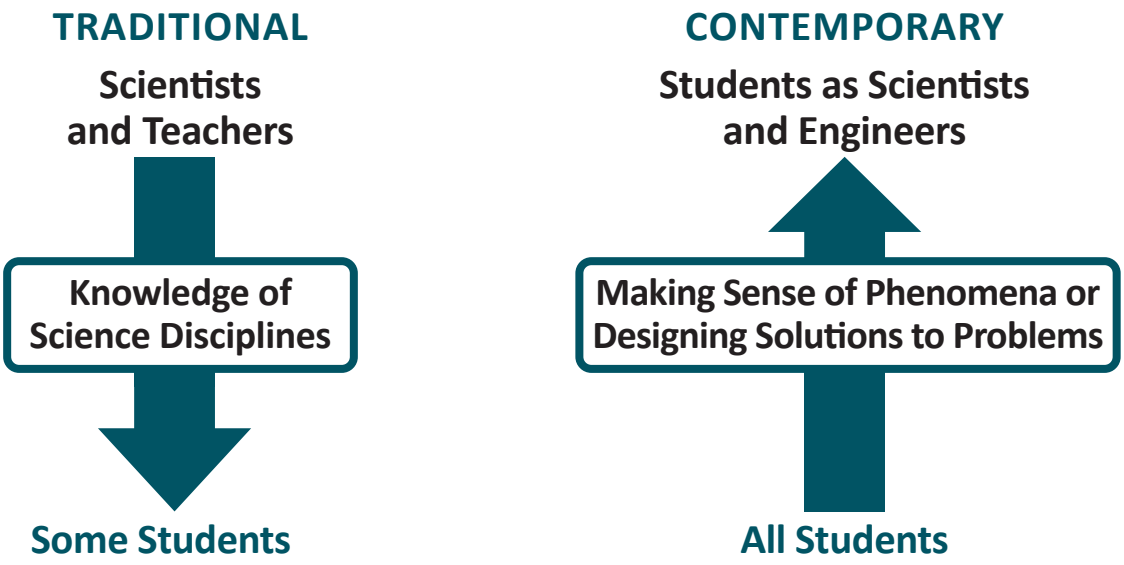
The *Framework* was based on extensive research literature, which provided the foundation for the NGSS and state standards. To date, 20 states and the District of Columbia have adopted the NGSS, and 24 states (including New York) have adapted the *Framework* and the NGSS (https://ngss.nsta.org/About.aspx). In New York, all levels of implementation at State, regional, and local efforts have been underway.



Before the *Framework* and the NGSS, research, policy, and practice in science education did not work well together. Research focused on conceptual work, such as project-based learning, problem-based learning, or place-based learning of a limited number of science topics. Policy focused on science standards consisting primarily of science concepts to be tested. Practice saw limited relevance of research or policy for students in the classroom. After the *Framework* and the NGSS, there is a consensus among research, policy, and practice to achieve common goals. With the standards (policy) based on extensive literature (research) in place, classroom implementation (practice) is key and the role of teachers is critical.

The new NYS P-12 SLS are expected of all students, thus "all standards, all students." The *Framework* and the NGSS expect all students to make sense of phenomena and design solutions to problems as scientists or engineers do in their professional work. The ESSA of 2015 identifies four accountability groups, including economically disadvantaged students, students from racial and ethnic groups, children with disabilities, and ELLs.

The new science standards place equity at the center by "flipping" traditional approaches to contemporary approaches. In traditional approaches, scientists and science teachers defined the knowledge of science disciplines for students to learn. This canonical science knowledge was typically presented in science textbooks. Some students learned science, but science did not make sense to many students. In contemporary approaches, all students are making sense of phenomena and designing solutions to problems as scientists and engineers do in their work. By engaging in the practices of scientists and engineers, students develop an understanding of core ideas in disciplines and crosscutting concepts that apply across disciplines.



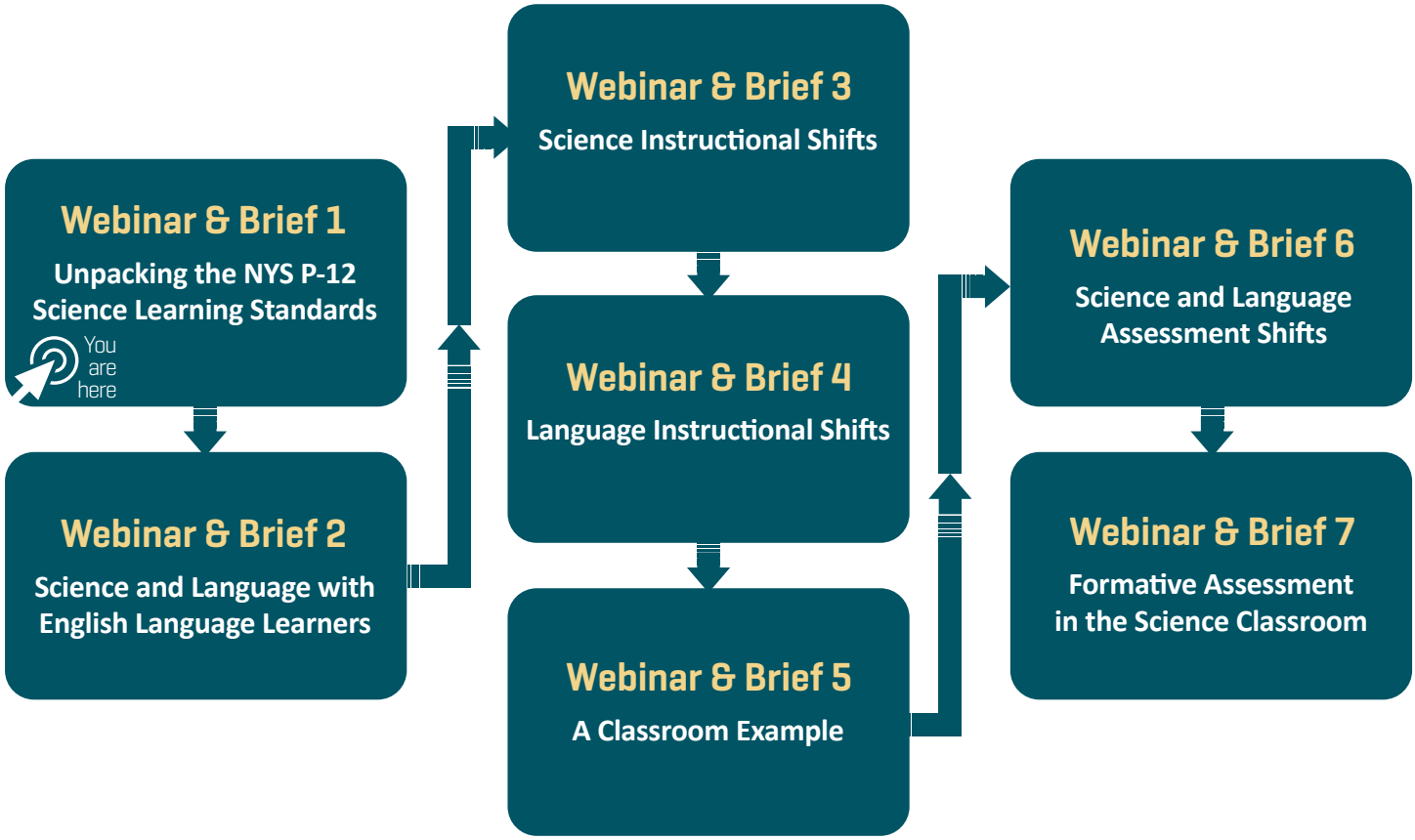
Conceptual Shifts in Science and Connections to Other Subjects

The new NYS P-12 SLS involve conceptual shifts in science education broadly, which are summarized as follows:

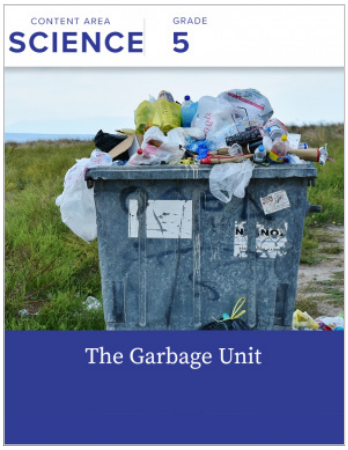
- "All standards, all students"
- Science is connected to the real world.
- Science standards indicate student outcomes at the end of each grade level or grade band. Standards are not curriculum.
- Science standards promote learning progressions across P-12 grades.
- Science and engineering are integrated.
- Science standards are aligned with English language arts and mathematics standards.
- Science standards prepare students for college, career, and civic engagement.

The new NYS P-12 SLS, intended for all students, are integrated with engineering and aligned with English language arts and mathematics. As such, these standards are consistent with current efforts to capitalize on "convergence" across (1) broadening participation of diverse student groups; (2) STEM disciplines; and (3) technological innovations, such as computational thinking and robotics. Such convergence represents the lives of students and teachers who are expected to integrate multiple subjects, including English language arts, mathematics, science, social studies, and other subjects in school. However, this emphasis on convergence across subjects for all students is a contrast to school subjects that have traditionally remained in silos. In particular, this emphasis is a contrast to science or STEM subjects that have traditionally been accessible to a select few. Instead, the new science standards stress that school subjects must "take a seat at the table" to serve all students, including ELLs.

Map of webinar and brief series on integrating science and language with ELLs



Additional Resources



Science And Integrated Language (SAIL)

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Visit our research team's website and access the unit:
www.nyusail.org

NYS P-12 Science Learning Standards:
http://www.nysed.gov/curriculum-instruction/science

NYSED Office of Curriculum and Instruction:
http://www.nysed.gov/curriculum-instruction

Office of Bilingual Education and English as a New Language:
http://www.nysed.gov/bilingual-ed

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