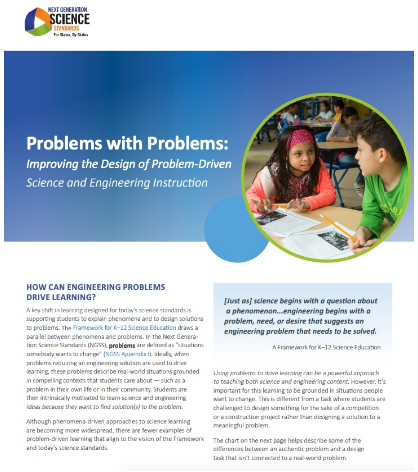
NGSS NOW

7 things to know about quality K–12 science education in **April 2021**

1 Problems with Problems: Improving the Design of Problem-Driven Science and Engineering Instruction

A key shift in learning designed for today's science standards is supporting students to explain phenomena and to design solutions to problems. To complement existing guidance on phenomena-driven instruction, a new resource from NextGenScience provides quick examples and guidance on designing learning driven by engineering design problems.

See the resource here.



NEXT GENERATION SCIENCE STANDARDS

Problems with Problems:
Improving the Design of Problem-Driven Science and Engineering Instruction

HOW CAN ENGINEERING PROBLEMS DRIVE LEARNING?

A key shift in learning designed for today's science standards is supporting students to explain phenomena and to design solutions to problems. The Framework for K–12 Science Education draws a parallel between phenomena and problems. In the Next Generation Science Standards (NGSS), **problems** are defined as "situations somebody wants to change" (NGSS Appendix I). Ideally, when problems requiring an engineering solution are used to drive learning, these problems describe real-world situations grounded in compelling contexts that students care about — such as a problem in their own life or in their community. Students are then intrinsically motivated to learn science and engineering *ideas because they want to find solution(s) to the problem.*

Although phenomena-driven approaches to science learning are becoming more widespread, there are fewer examples of problem-driven learning that align to the vision of the Framework and today's science standards.

[Just as] science begins with a question about a phenomenon...engineering begins with a problem, need, or desire that suggests an engineering problem that needs to be solved.

A Framework for K–12 Science Education

Using problems to drive learning can be a powerful approach to teaching both science and engineering content. However, it's important for this learning to be grounded in situations people want to change. This is different from a task where students are challenged to design something for the sake of a competition or a construction project rather than designing a solution to a meaningful problem.

The chart on the next page helps describe some of the differences between an authentic problem and a design task that isn't connected to a real-world problem.

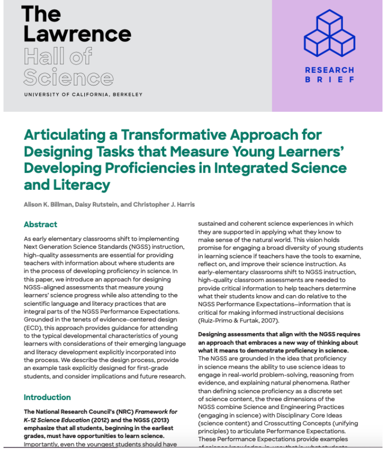
2 A Call to Action for Science Education

The National Academies of Sciences, Engineering, and Medicine has appointed an expert panel to author a national call to action to advance science education programs and instruction in K–12 and post-secondary institutions in ways that will prepare students to tackle future global challenges both as engaged citizens and as future scientists. Drawing on the National Academies' existing body of science education work, this project seeks to identify major challenges for implementing coherent science education, identify best practices and future areas of research, and provide policy recommendations for strengthening science teaching and learning.

Share your perspective with the expert panel here or register to participate in today's (April 8th) public stakeholder event here.

3 Designing Tasks that Measure Young Learners' Developing Proficiencies in Integrated Science and Literacy

This research brief provides guidance on designing developmentally appropriate, NGSS-aligned assessment for elementary level students. The Next



The Lawrence Hall of Science

UNIVERSITY OF CALIFORNIA, BERKELEY

RESEARCH BRIEF

Articulating a Transformative Approach for Designing Tasks that Measure Young Learners' Developing Proficiencies in Integrated Science and Literacy

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Abstract

As early elementary classrooms shift to implementing Next Generation Science Standards (NGSS) instruction, high-quality assessments are essential for providing teachers with information about where students are in the process of developing proficiency in science. In this paper, we introduce an approach for designing NGSS-aligned assessments that measure young learners' science progress while also attending to the scientific language and literacy practices that are integral parts of the NGSS Performance Expectations. Grounded in the tenets of evidence-centered design (ECD), this approach provides guidance for attending to the typical developmental characteristics of young learners with considerations of their emerging language and literacy development explicitly incorporated into the process. We describe the design process, provide an example task explicitly designed for first-grade students, and consider implications and future research.

Introduction

The National Research Council's (NRC) *Framework for K-12 Science Education* (2012) and the NGSS (2013) emphasize that all students, beginning in the earliest grades, must have opportunities to learn science. Importantly, even the youngest students should have sustained and coherent science experiences in which they are supported in applying what they know to make sense of the natural world. This vision holds promise for engaging a broad diversity of young students in learning science if teachers have the tools to examine, reflect on, and improve their science instruction. As early-elementary classrooms shift to NGSS instruction, high-quality classroom assessments are needed to provide critical information to help teachers determine what their students know and can do relative to the NGSS Performance Expectations—information that is critical for making informed instructional decisions (Ruiz-Primo & Furtak, 2007).

Designing assessments that align with the NGSS requires an approach that embraces a new way of thinking about what it means to demonstrate proficiency in science. The NGSS are grounded in the idea that proficiency in science means the ability to use science ideas to engage in real-world problem-solving, reasoning from evidence, and explaining natural phenomena. Rather than defining science proficiency as a discrete set of science content, the three dimensions of the NGSS combine Science and Engineering Practices (engaging in science) with Disciplinary Core Ideas (science content) and Crosscutting Concepts (unifying principles) to articulate Performance Expectations. These Performance Expectations provide examples

Generation Science Assessments for Young Scientists (NGSA-YS) approach integrates "science and literacy in ways that fit the needs of early elementary classrooms, thereby increasing the likelihood that they will be usable and instructionally beneficial to teachers and students."

See the brief here.

4 Toxic Past, Green Futures: Environmental Justice and Justice-Centered Phenomena in STEM Grades 6–12

"Why do some communities bear a higher pollution burden than others? Which communities will be most heavily hit by our rapidly warming climate? How can we work with students to research, investigate, and fight for environmental justice?" Join educators from public radio's Science Friday to explore environmental justice work in the classroom, share some clear strategies for moving students from research to action, and examine justice-centered phenomenon as an aspect of antiracist STEM practice.

See the virtual conference here.

5 Science Professional Learning Standards for Online Learning

In this newly released resource, the Council of State Science Supervisors (CSSS) provides strategies and resources for delivering professional learning through online platforms in ways to meet the Science Professional Learning Standards (SPLS). These standards can be used to support the design of effective educator professional learning, even in an online setting.

See the resource here.

6 The Promise and Pitfalls of Citizen Science

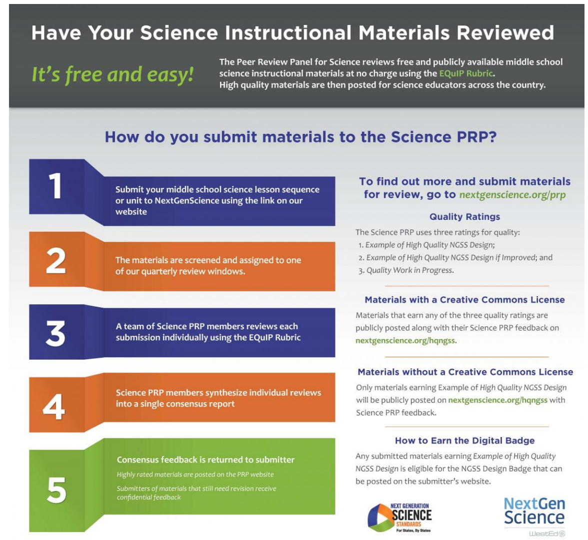
In honor of Global Citizen Science month (April), a symposium by the American Philosophical Society's Library and Museum explores citizen science over time. The virtual event will focus on the work of citizens "who lacked formal training and whose work sometimes went unacknowledged but whose contributions significantly added to the advancement of knowledge."

Register for the symposium here and access the recordings here.

7 A Call for Middle School Lesson and Units Designed for the NGSS

States, districts, or other organizations developing free and publicly available middle school lessons or units for the Next Generation Science Standards (NGSS) are encouraged to submit them to NextGenScience's Peer Review Panel (PRP) for a free review. The PRP is a group of expert educators who use the EQuIP Rubric for Science to evaluate the alignment of lessons and units to the NGSS and provide detailed, criterion-based feedback and suggestions for improvement. Units earning top EQuIP ratings are posted publicly as high-quality examples and all other units receive confidential feedback.

Learn more about the review process here.



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