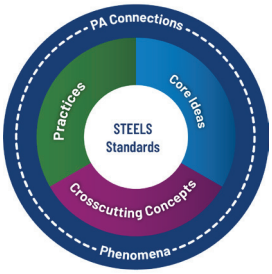
Pennsylvania STEELS Standards 101:
What Teachers Need to Know About the Science, Technology & Engineering, and Environmental Literacy & Sustainability Standards

This resource provides answers to the following key questions for teachers:

- What are the STEELS Standards?
- How will classroom instruction change with the STEELS Standards?
- Why is this instructional shift important for your students?
- How can you assess learning of the STEELS Standards?
- What resources will best support STEELS Standards implementation?



What Are the STEELS Standards?

Pennsylvania's Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards were approved in 2022 with a plan for full implementation in all LEAs by 2025. These standards set high expectations for all K–12 students to study the natural and human-made world through inquiry, problem solving, critical thinking, and authentic exploration.

A major difference between the STEELS Standards and previous standards is "multi-dimensional" learning. Multi-dimensional learning refers to the thoughtful and deliberate integration of several of the following dimensions: Scientific and Engineering Practices (SEPs), Technology and Engineering Practices (TEPs), Disciplinary Core Ideas (DCIs), and Crosscutting Concepts (CCCs).

All three sections of the Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards are primarily based on the following research-based source documents:

S	TE	ELS
Science	**Technology and Engineering**	**Environmental Literacy and Sustainability**
A Framework for K–12 Science Education	Standards for Technological and Engineering Literacy	North American Association for Environmental Education (NAAEE) Guidelines for Excellence

How Will Classroom Instruction Change with the STEELS Standards?

Science, Technology, Engineering, Environmental Literacy, and Sustainability Education will...

Focus less on:	Focus more on:
1. Learning of ideas disconnected from questions about phenomena or problems	**1.** Systems thinking and modeling to explain phenomena and to give a context for the ideas to be learned
2. Teachers providing information to the whole class	**2.** Students conducting investigations, solving problems, and engaging in discussions with teacher guidance
3. Teachers posing questions with only one right answer	**3.** Students discussing open-ended questions that focus on the strength of the evidence used to generate claims
4. Students reading textbooks and answering questions at the end of each chapter	**4.** Students reading multiple sources and developing summaries of information
5. Worksheets	**5.** Students writing of journals, reports, posters, and media presentations that offer explanations and arguments

The numbered information above is adapted with permission from: National Research Council. (2015). *Guide to implementing the Next Generation Science Standards.* The National Academies Press. https://doi.org/10.17226/18802

Why is This Instructional Shift Important for Your Students?

This is a shift from "learning about" to "figuring out" that puts students in the driver's seat. These K–12 standards represent a significant shift away from rote memorization and heavy reliance on learning by reading the textbook to greater student ownership of their own learning focused on explaining real-world phenomena and solving meaningful problems. Thus, the STEELS Standards represent a shift in both the *how* and the *what* of science teaching and learning.

Multi-dimensional learning means students build disciplinary content knowledge while engaging in science, technology, and engineering practices to understand the world around them. The STEELS Standards ask Pennsylvania students to learn to think, investigate, and communicate like scientists and engineers.

Education research is clear that these shifts not only improve student engagement and interest, but also that all students learn and retain knowledge best this way. This is especially important for students from communities or backgrounds that are often underrepresented in STEM fields.

Example Instructional Shift

Learning through rote memorization and tasks
Students learn how producers differ from consumers and create a model of a food web with no connection to a real-world example.

Learning through real-world phenomena
Students create a model to explain what effect cutting many of Pennsylvania's large forests in the early 1900s had on the recovery of the local deer population.

How Can You Assess Learning of the STEELS Standards?

A shift from "learning about" to "figuring out" is not just important in instruction; it's important in assessment too.

High-quality assessments of STEELS Standards learning goals…

Focus less on:	Focus more on:
Science topics. Tasks emphasize science knowledge rather than applying their knowledge to figure something out.	**Phenomena, Problems, and Issues.** Students figure out a phenomenon, engineering design problem, or environmental issue by using the targeted learning goals.
Assessing dimensions separately. Tasks only require students to use one dimension at a time, such as analyzing data or creating a model separate from their knowledge about cause and effect or life science ideas.	**Multi-dimensional Learning.** Students use knowledge and practice together to successfully complete a task.
Rote memorization. Tasks emphasize right and wrong answers without reasoning. Or, tasks ask students to explain the same phenomenon they already worked to explain during instruction, thus testing one-dimensional rote knowledge.	**Student Reasoning.** Students apply, via the practices, their understanding of core ideas and crosscutting concepts to address uncertainty associated with a phenomenon or problem.
Tasks limiting students' ability to answer the task based on things that are not being assessed, including: • Only one way for students to make their thinking visible or most of the task is limited to right/wrong answers. • Not enough scaffolds such that students do not know what they need to do to complete the task. • Too many scaffolds give away the answer to students. • Language barriers. • Questions are unclear or don't make sense	**Being fair and accessible.** Tasks build student confidence by: • Including multiple ways for students to both access the task prompts and to make their thinking visible. • Including appropriate scaffolds and accessible language. • Flowing in a way that is understandable from the students' perspectives such that they are motivated to complete the task.

Table adapted from EdReports and NextGenScience. (2021). *Critical features of instructional materials design for today's science standards: A resource for science curriculum developers and the education field.* WestEd. https://www.nextgenscience.org/sites/default/files/resource/files/criticalfeaturesinstructionalmaterials_jul_2021.pdf

What Resources Will Best Support STEELS Standards Implementation?

One of the best ways to begin learning about these instructional shifts is participating in professional learning that immerses learners in the shifts firsthand.

Reach out to your school, LEA, or Intermediate Unit (IU) leaders to learn about the plan to obtain high-quality instructional programs and professional learning that will support your work as a teacher.

Other resources that can support your work include:

- PDE STEELS Hub on SAS (https://www.pdesas.org/Page/Viewer/ViewPage/58/)
- STEM Teaching Tools (https://stemteachingtools.org/)
- Examples of quality lessons and units (https://www.nextgenscience.org/resources/examples-quality-ngss-design)
- Your local Pennsylvania Intermediate Unit (IU) office (https://www.paiu.org/)