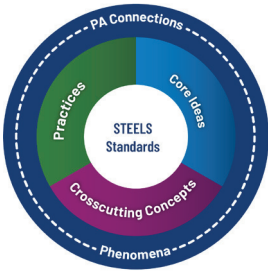
Pennsylvania STEELS Standards:
Elementary Administrator Reference Guide

Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards set clear expectations for what all K–5 students should know and be able to do. This reference guide aims to inform elementary administrators about what is new for Pennsylvania's new K–5 STEELS Standards and provide considerations for supporting their implementation.



Why are STEELS Standards Important for Elementary Students in Pennsylvania?

Young children who can make sense of their environment and solve problems will have a strong foundation to live and study in a world that is increasingly rooted in science, technology and engineering, and environmental literacy and sustainability.

The STEELS Standards are designed as a progression of knowledge and skills from kindergarten through high school, providing students with opportunities to develop more sophisticated knowledge over time. The study of science, technology, engineering, environmental literacy, and sustainability in elementary school has always been important, but it is even more crucial now to prepare students for success in secondary school, college, career, and citizenship.

What is New about the STEELS Standards in Grades K–5?

The STEELS Standards were approved in 2022 with a plan for full implementation in all LEAs by 2025. These standards guide the study of the natural and human-made world by fostering young children's growing curiosity about the world around them.

These learning goals represent a fundamental shift in science, technology, engineering, environmental literacy, and sustainability and require a different approach to learning. The STEELS Standards emphasize that students are actively learning in these disciplines — a type of learning that is more than a series of isolated facts. This approach enables students to view these fields as interrelated and connected to their everyday lives.

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 to support students to make sense of the world around them: Scientific and Engineering Practices (SEPs), Technology and Engineering Practices (TEPs), Disciplinary Core Ideas (DCIs), and Crosscutting Concepts (CCCs).

How will Instruction Designed for the STEELS Standards Look Different in Classrooms?

The shift to instruction that prepares students to meet the STEELS Standards will require time, sustained professional learning, and support from high-quality instructional programs. Schools and LEAs will need to plan for a transition period to implement the STEELS Standards and not expect the change to happen overnight. Some of these new classroom features might include:

Students are active and talking about their learning.

When students are successfully using science and engineering practices and technology and engineering practices, they are actively discussing and negotiating their ideas. This is a shift from classrooms where students sit quietly in rows, copying notes during a lecture.

Students figure out the answer, rather than the answer being written on the board.

Teachers are often required to write the day's learning goal or standard on the board. With the emphasis on students developing explanations of phenomena or designing solutions to problems, the learning goal should now be written in a way that doesn't "give away" the answer to the students — such as a question students will be working to figure out.

Students know why they are engaging in classroom activities beyond "because the teacher said so."

Because conceptual understanding is linked to a student's ability to develop explanations of phenomena and design solutions, students should readily know the answer to the question "why do I need to know this?" This focus on real-world application allows students to see science, technology, engineering, environmental literacy, and sustainability as applicable and useful in their everyday lives.

What can Elementary Administrators do to Support STEELS Standards Implementation?

Attend STEELS Standards professional learning for administrators.

Professional learning designed for leaders will increase capacity for providing instructional leadership for STEELS learning goals, including supervision of teachers, policies and resource-allocation, and teacher opportunities to learn. (*Science and Engineering in Preschool Through Elementary Grades*, page 221)

Communicate a shared vision for STEELS Standards learning in grades K–5 and establish this shared vision as a building priority.

Establishing a building wide vision for STEELS Standards learning and shared responsibility to achieve it is key for a successful elementary program. Effective leaders "inspire teachers, parents, school community leaders, and students around a common vision" that can be used to describe the reasoning behind changes during the transition to the new learning goals. (*Science and Engineering in Preschool Through Elementary Grades*, page 215; *Science Teachers' Learning*, page 195)

Select high-quality instructional programs and resources.

It is unreasonable to expect elementary school teachers to search for and compile their own instructional resources online to plan what they will teach. Districts should plan to evaluate and select materials based on a clear set of criteria that reflect the instructional shifts of the STEELS Standards and a transparent, evidence-based process that engages teachers. Modification of programs to fit the unique needs of the STEELS Standards is best done through districtwide initiatives to promote coherence and quality for all students. (*Science and Engineering in Preschool Through Elementary Grades*, page 157; *Guide to Implementing the NGSS*, page 56)

Provide sustained professional learning opportunities for teachers that support the enactment of high-quality instructional programs and resources.

Elementary teachers need opportunities to develop their instructional practice through effective professional learning experiences that are long-term, coherent, and connected to their curricular program (*Science and Engineering in Preschool Through Elementary Grades*, page 185; *The Elements*, page 10).

Develop a schedule and model that support adequate instructional time for STEELS Standards learning for all elementary students.

Elementary leaders will need to design a schedule and staffing model that support a comprehensive and consistent focus on the STEELS learning goals. Possible staffing models include:

- *Classroom Teacher Model:* One teacher is responsible for teaching all subjects in a self-contained classroom.
- *Team Teaching Model:* A specialist provides technical assistance related to the STEELS Standards to the classroom teacher, who maintains primary responsibility for instruction.
- *STEELS Specialist Model:* One individual is hired specifically to teach STEELS learning goals across grade levels.

Schedules and policies should also be designed to ensure students are not regularly being pulled out of science and engineering instruction for other interventions. (*Models of Providing Science Instruction in the Elementary Grades*, page 6)

Engage with families.

School leaders should engage with families and the local community to support children's opportunities for engaging in STEELS Standards learning. Relationships between teachers and the local community can lead to instruction that is more meaningful and relevant to students, as well as improve out-of-school learning opportunities. (*Science and Engineering in Preschool Through Elementary Grades*, page 64)

Manage and monitor progress of STEELS Standards implementation.

STEELS Standards implementation will require a well-executed plan and management, which includes the key action of monitoring progress along the way. Leaders will need to determine which measurable data they will collect and use to inform the direction of their work and how progress will be communicated to others. (*District Implementation Indicators*, page 2; *Framework for Leading NGSS Implementation*, page 37)

Supporting Science Learning and Literacy Development Together

A randomized, controlled trial in 1st grade classrooms found that use of a science instructional program that integrates science and literacy led to increased science outcomes and language development for students. At the same time, these students' performances in reading assessments did not decrease, suggesting dedicating time to science can support student learning in both reading and science. A 2017 study found that school districts that taught a science curriculum that prioritized inquiry, engineering design, and experimentation over memorization saw improved language development and test score increases in English language learner populations in particular.

How Can I Support the Integration of STEELS Standards with Other Content Areas, Including Mathematics and English Language Arts?

Integrating STEELS Standards with other content areas at the elementary level is one strategy to improve the coherence of student learning experiences while making the most of already-limited instructional time. The National Academies of Sciences, Engineering, and Medicine (2022, page 133) has identified the following principles for creating productive connections across domains:

- **Engage children in investigation and design experiences that draw on multiple domains.** When instruction situates children's science and engineering learning in meaningful and rich contexts, children engage in activity that recruits—and potentially deepens—practices, skills, and knowledge developed in other parts of the school day and may build positive identities in science and engineering (e.g., English, 2016; McClure et al., 2017; Moore, Johnston, and Glancy, 2020; NRC, 2014b).
- **Make integration explicit in designs and teaching.** Even in meaningful contexts that call for activity that transcends disciplines, integration may not automatically support productive learning experiences (NRC, 2014b). Therefore, designs need to consider the potential learning and identity development within the multiple domains, and make relationships across domains explicit for children.
- **Support children's knowledge in individual disciplines.** Domains often need to be learned in and of themselves, with dedicated time for each subject and a basis in a learning trajectory for children's development of central understanding and practices (Clements and Sarama, 2021b; English, 2016). For example, teaching science within the context of literacy can be reduced to "content-rich literacy," where the target literacy knowledge and practices drive the work, and children do not learn meaningful science content or develop an understanding of science and engineering practice.
- **More integration is not necessarily better.** Research comparing various types of integrated curricula does not always support full integration (NRC, 2014b). Focusing on opportunities to use the disciplines in mutually supportive ways can help to ensure that children are learning and developing practices in each.

Where Can I Learn More about STEELS Standards Implementation in Elementary Grades?

- PDE STEELS Hub on SAS (https://www.pdesas.org/Page/Viewer/ViewPage/58/)
- Rise and Thrive with Science: Teaching PK–5 Science and Engineering (https://doi.org/10.17226/26853)
- STEM Teaching Tools #21: What School Building Administrators Should Know About the New Vision for K–12 Science Education (https://stemteachingtools.org/brief/21)
- STEM Teaching Tools #43: Why Do We Need to Teach Science in Elementary School? (https://stemteachingtools.org/brief/43)
- STEM Teaching Tool #62: What Does Subject Matter Integration Look Like in Elementary Instruction? Including Science is Key! (https://stemteachingtools.org/brief/62)
- Your local Pennsylvania Intermediate Unit (IU) office (https://www.paiu.org/)

See the research referenced in this guide here.