Frequently Asked Questions:
High-Quality Instructional Programs and Resources that Support Pennsylvania STEELS Standards

High-quality curricular programs are an important part of implementing Pennsylvania's rigorous new Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards. This document addresses the following frequently asked questions about resources to support schools and LEAs with the STEELS Standards:

- What makes the STEELS Standards unique to Pennsylvania?
- What are high-quality instructional programs for the STEELS Standards?
- What does the research say about the impact of high-quality programs?
- How can an LEA make sure a program is high quality?
- What are tools and resources to help determine whether the design of an instructional program is high quality and will provide a solid foundation for the STEELS Standards?
- What are considerations for an effective selection process?
- What scope and sequence will best support coverage of all of the STEELS Standards?
- Where can I learn more about high-quality programs and resources for the STEELS Standards?

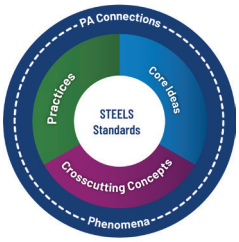
What makes the STEELS Standards Unique to Pennsylvania?

While the STEELS Standards are based on similar underlying research as other state standards, Pennsylvania's standards are unique and emphasize the local environment and priorities. The learning goals require all Pennsylvania students to not only focus on the natural sciences, but also technology and engineering as well as environmental literacy and sustainability.

Knowing the source documents behind each part of the standards can help education leaders across Pennsylvania make decisions about curriculum selection and modification.

The Pennsylvania Department of Education has been using Meaningful Watershed Educational Experiences (MWEEs) and Engineering byDesign as part of its support of the STEELS Standards. These approaches have been used by educators across multiple districts and states to enhance teaching and learning experiences.

What are High-Quality Instructional Programs for the STEELS Standards?



High-quality curricular or instructional programs are a coherent sequence of lessons and units that target learning of grade-appropriate skills and knowledge across an entire grade band through approaches that are well supported by research. For the STEELS Standards, these features include resources that support:

A shift from "learning about" to "figuring out" and puts students in the driver's seat.
These K–12 standards represent a significant shift away from rote memorization of facts toward student-centered learning to build deep conceptual understanding of real-world occurrences and solve meaningful problems. High-quality programs will support teachers to facilitate these shifts in not just what kids learn, but how they learn.

"Multi-dimensional learning" approaches in which students learn the content while engaging in science, technology, and engineering practices and understanding how the science fits into the environment and the world around them.
The STEELS Standards require Pennsylvania students to learn to think, investigate, solve problems, and communicate like scientists, technologists, and engineers and to understand and improve the world in which students live.

The learning progression is coherent from the student perspective and builds on students' prior knowledge.

The resources support teachers to logically help students see connections across lessons and explicitly identify and build on their prior learning in multiple dimensions. Students can see how learning from previous lessons supports their scientific reasoning or problem solving in the current lesson.

Instruction is relevant and authentic to students.

High-quality materials motivate students to make sense of their world and solve problems by taking advantage of students' own questions and prior experiences in the context of the students' home, neighborhood, and community as appropriate.

Students express, clarify, justify, interpret, and represent their ideas.

The materials support opportunities for students to make their thinking and reasoning visible in various ways, including collaboration and discussions with other students to gather feedback and refine their ideas as the work unfolds.

What does the Research Say about the Impact of High-Quality Programs?

Many school districts have previously expected teachers to develop their own curriculum and resources from scratch. However, the complexity of the shifts required by the STEELS Standards means it is no longer reasonable for teachers to search for and compile their own instructional resources online to plan what they will teach.

Even if no program is designed specifically for the STEELS Standards, existing high-quality programs and professional learning to use them can still support teachers to build a solid foundation that then can be modified to address gaps and make local connections.

Research shows high-quality programs do the following:

Enhance student outcomes.

High-quality programs improve student outcomes when paired with curriculum-specific and ongoing professional learning.

- A 2023 randomized trial found that elementary students using a high-quality program outperformed students in comparison classrooms on a standardized science assessment while achieving English language arts/literacy scores consistent with comparison schools.
- A 2022 randomized trial found that middle school students in classrooms with high-quality programs significantly outperformed students in comparison classrooms.
- A 2016 study provided evidence that the effect of high-quality curricula on learning is the same as moving from an average performing teacher to one at the 80th percentile.
- One 2016 study showed use of a high-quality program raised student achievement by 3.6 percentile points, which is larger than the improvement gains of a new teacher after their first three years and led to over half a year of additional learning for students compared to comparison classrooms.

Ensure equitable and high-quality experiences for all students.

A 2019 study found that using the internet to piece together supplemental lessons and activities to determine what they will teach — rather than using a coherent, high-quality program — leads to lower student outcomes, particularly for students of color and those experiencing poverty.

Save teachers time and allow them to apply their expertise in the classroom.

2017 research showed that teachers spend an average of seven hours per week searching for instructional resources (both free and paid-for) and another five hours per week creating their own curricular resources. A high-quality program allows teachers to apply their expertise toward classroom instruction and work with students to improve their knowledge and skills.

Improve student outcomes in a more cost-effective way than alternate strategies.

A 2015 report indicated using a rigorous instructional program delivers more of a return on investment than many other reforms, suggesting it is a cost-effective strategy to improve student outcomes at scale.

How can an LEA Make sure a Program is High Quality?

Although many publishers make alignment claims that their programs are designed to support learning goals based on *A Framework for K–12 Science Education*, some of these resources are better designed than others. Just as higher cost does not guarantee higher quality of a program, neither do stated alignment claims.

It is important that an LEA identifies a process to collect evidence that supports the claims the program makes rather than taking the publisher's word for it. While LEA leaders may want to see efficacy evidence of individual programs before considering them for adoption, it is likely not feasible (due to cost and design challenges) to find independent studies that show the effectiveness of any single program. It is therefore particularly important that leaders evaluate materials for the design features they value.

An LEA may find independent instructional materials reviews by organizations like EdReports to be a helpful source for an external evaluation of materials. These reviews, when used alongside a LEA-level review process, can ensure an LEA has a way to intentionally look for evidence of local priorities (e.g., technology requirements) and adequately address the specific needs of its students (e.g., strategies to support multilingual learners).

Even when a quality program is selected, it is crucial that it is paired with sustained professional learning to support effective STEELS teaching and learning.

What are Tools and Resources to Help Determine Whether the Design of an Instructional Program is High Quality and will Provide a Solid Foundation for the STEELS Standards?

There are many rubrics and independent reviewing organizations that help measure the presence of these research-based features that the STEELS Standards require. Many of these resources are designed for the Next Generation Science Standards, which are based on the same underlying research as the STEELS Standards. The following resources are free and publicly available and can inform a solid foundation on which to make STEELS Standards-specific modifications. These resources include:

EdReports Science Reviews

These reviews of instructional programs gather and analyze evidence related to the quality of a program's alignment to standards and usability based on their criteria and evidence guides.

EQuIP Rubric for Science

This tool provides criteria for measuring the degree to which units are designed for multi-dimensional standards, which may be used to spot-check individual units in full programs.

Lesson Screener

This screener provides criteria for a quick look at the degree to which lessons and units are designed for multi-dimensional standards.

NextGen TIME

This toolkit and process supports educators to evaluate, select, and implement instructional materials designed for today's multi-dimensional standards.

Nextgenscience.org Quality Examples of NGSS Design

These stand-alone units (not full programs) are reviewed with the EQuIP Rubric and can serve as concrete examples to illustrate critical features of high-quality resources in professional learning settings.

Science Assessment Task Screening Tools

These tools guide the evaluation of assessment tasks to determine whether they are designed for multi-dimensional standards.

What are Considerations for an Effective Selection Process?

It doesn't just matter that an LEA ends up adopting a high-quality instructional program. The process used to select and adopt the program greatly influences the level of teacher buy-in for the program. Effective adoption processes involve teachers and a districtwide, transparent, and evidence-based approach. Free and publicly available toolkits can help districts design such an approach.

Adoption Priorities

- Selecting materials is a decision worthy of study and prioritization.
- Local context and instructional vision should drive decision making.
- Educator voice and expertise must be at the center of the decision.
- Materials should be aligned to high standards, attend to instructional shifts, and be based on research.
- Professional learning and implementation need to be considered from the beginning of selection processes.

— *EdReports, Selecting for Quality*

What Scope and Sequence for Secondary Grades will Best Support Coverage of all of the STEELS Standards?

The Pennsylvania STEELS Standards lay out what students need to know by the end of the 6–8 grade band and the 9–12 grade band, but not in each specific middle and high school grade level. Districts and schools therefore will make decisions about course sequencing and scheduling that ensure all students have the time and opportunity to become proficient in all of the STEELS Standards.

Example scope and sequence options are available, but an LEA would benefit from first selecting a high-quality instructional program and then designing a scope and sequence that uses the program as a foundation. That may help to remove unnecessary constraints or barriers for a new program that would otherwise be a good fit for an LEA. Modification of the scope and sequence 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.

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 (STEL)	North American Association for Environmental Education (NAAEE) Guidelines for Excellence

Where can I Learn More about High-Quality Programs and Resources for the STEELS Standards?

- PDE STEELS Hub on SAS (https://www.pdesas.org/Page/Viewer/ViewPage/58/)
- Critical Features of Instructional Materials Design for Today's Science Standards (https://www.nextgenscience.org/sites/default/files/resource/files/criticalfeaturesinstructionalmaterials_jul_2021.pdf)
- Engineering byDesign (https://www.iteea.org/engineering-bydesign)
- NOAA Meaningful Watershed Educational Experience (https://www.noaa.gov/education/explainers/noaa-meaningful-watershed-educational-experience)
- Your local Pennsylvania Intermediate Unit (IU) office (https://www.paiu.org/)

See the research referenced in this guide here.