Pennsylvania's New Science, Technology & Engineering, and Environmental Literacy & Sustainability Learning Goals

Parent Guide for Grades 6–8

S	TE	ELS
Science	Technology and Engineering	Environmental Literacy and Sustainability

About the STEELS Standards: Reshaping Education for All Pennsylvania Students

To better prepare Pennsylvania students for college and careers, schools need to ensure that high-quality science, technology, engineering, environmental literacy, and sustainability education is accessible to all students — regardless of ethnicity or zip code.

The Science, Technology & Engineering, and Environmental Literacy & Sustainability (STEELS) Standards set high expectations for what all students should know and be able to do to provide all students access to a challenging education. These learning goals guide the study of the natural and human-made world by fostering children's growing curiosity about the world around them at a young age all the way through high school.

The STEELS Standards were developed based on research about how students learn best by Standards Writing Committees made up of Pennsylvania educators and experts in the field.

Fact: "Standards" are not "curriculum." "Standards" provide clarity about what students should know and be able to do by the end of each grade level. "Curriculum" refers to the planned instruction that supports students to meet those expectations. Please contact your child's teacher or school if you have questions about their curriculum.

How will Pennsylvania's STEELS Standards Prepare your Students for Academic Success?

Rigorous academic standards are a powerful foundation to help students build a thorough understanding of science, technology and engineering, and environmental literacy and sustainability over time.

A strong education in these fields in middle school will pave the way for increased success in high school and beyond. The STEELS Standards enable teachers to offer all students interactive instruction that promotes analysis and interpretation of data, critical thinking, problem solving, and connections across the STEELS subject areas — with a high set of expectations for achievement in grades 6–8.

The STEELS Standards complement English Language Arts and Mathematics Pennsylvania Core Standards, enabling classroom instruction to reflect a clearer picture of the real world, where solving problems often requires skills and knowledge from multiple subjects.

What is Pennsylvania's Vision for Science, Technology, Engineering, Environmental Literacy, and Sustainability Education?

The STEELS Standards reflect decades of research and advances in teaching and learning. To equip students to think critically, analyze information, and solve complex problems, the standards are arranged such that — from elementary through high school — students have multiple opportunities to deepen knowledge and skills by building upon important concepts and expanding their understanding of connections across the STEELS subjects. Parents and guardians should understand that while some content might be similar to what it was in the past, it may look different from how they were taught.

As the STEELS Standards are implemented in schools and LEAs, they will enable students to:

- Develop a deeper understanding of science, technology, engineering, environmental literacy, and sustainability beyond memorizing facts.
- Experience similar scientific, technology, and engineering practices as those used by professionals in the field.
- Build communication skills as they talk with other students to share, build upon, and revise their own thinking.

How will Students Learn Science, Technology, Engineering, Environmental Literacy, and Sustainability in the Classroom?

Each year, students should be able to demonstrate greater capacity for connecting knowledge across and between the physical sciences, life sciences, Earth and space sciences, technology and engineering design, and environmental literacy and sustainability.

During grades 6–8, your child will begin to form deeper connections between concepts and skills previously learned in grades K–5, such as collecting evidence and drawing conclusions, understanding relationships between objects, and critical thinking that leads to designing effective solutions for problems.

Students in grades 6–8 will explore questions such as:

Technology and Engineering

In grades 6–8, students will explore topics that will help prepare students for advanced classes like mechanics, robotics, or engineering-enriched science courses.

- Refining criteria and constraints when designing engineering solutions
- Technologies and human progress
- Open- and closed-loop systems

Environmental Literacy and Sustainability

In grades 6–8, students will explore topics that will prepare them for advanced environment classes.

- Sustainable agricultural and food systems
- Societal differences in natural resource management
- Local environmental issues impacting Pennsylvania's human and natural systems

Earth and Space Sciences

In grades 6–8, students will explore topics that will help prepare students for advanced classes like astronomy, environmental science, or geology.

- Solar system
- Earth's history
- Energy flows

Physical Sciences

In grades 6–8, students will explore topics that will prepare them for high school and college classes such as physics, forensics, or chemistry.

- Atomic chemistry
- Forces and fields
- Thermal energy
- The wave model

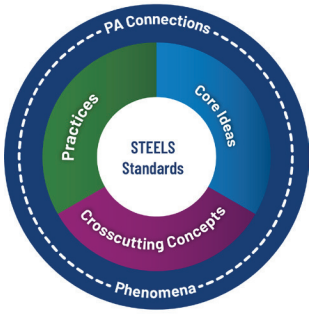
Life Sciences

In grades 6–8, students will explore topics that will help prepare students for advanced classes like biology, physiology, and genetics.

- Cells
- Gene variation
- Biodiversity

Multiple Dimensions of STEELS Standards Learning

The STEELS Standards emphasize distinct dimensions that help students learn. Each dimension is integrated into the STEELS Standards and — combined — the dimensions build a powerful foundation to help students build a cohesive understanding of these subjects over time.



Science, Technology, and Engineering Practices

A set of skills that scientists, technologists, and engineers use to explain the world or solve problems.

Example Practices: Communication; Planning and Carrying Out Investigations

Disciplinary Core Ideas

Explanatory ideas in each science discipline that scientists, technologists, and engineers use.

Example Disciplinary Core Ideas: Wave Properties; Weather and Climate

Crosscutting Concepts

Concepts that scientists, technologists, and engineers use to deepen their understanding of situations and make connections across subject areas.

Example Crosscutting Concepts: Cause and Effect; Structure and Function

Possible classroom activities look *less* like:	Possible classroom activities look *more* like:
Physical Science	**Physical Science**
Students memorize Newton's Law of Gravity.	Students gather and analyze evidence about gravity's effect on objects with different masses to figure out how this effect influences the motion of planets in our solar system.
Students follow scripted chemistry experiments.	Students demonstrate their knowledge of chemical reactions and energy change during reactions to design and explain a heat pack.
Students memorize the difference between Fahrenheit and Celsius.	Students construct arguments about the relationship between particle motion and temperature to figure out how these factors affect weather patterns in different climates.
Life Science	**Life Science**
Students memorize the equation for photosynthesis.	Students explain the chemistry behind photosynthesis to develop solutions for addressing food security challenges.
Students build a model of a cell out of gelatin and label its parts.	Students design a new cell to optimize a particular function, such as energy production.
Students draw an ecosystem on paper.	Students conduct research to identify significant changes in local ecosystem(s).
Earth and Space Sciences	**Earth and Space Sciences**
Students memorize the water cycle.	Students analyze real data to figure out what could be causing large-scale storms in large portions of the midwestern United States.

Possible classroom activities look *less* like:	Possible classroom activities look *more* like:
Students build a papier-mâché volcano.	Students develop an Earth model and research mantle convection motion to explain how Earth's surface could move from processes below the surface.
Students paint and position Styrofoam balls to represent planets in the solar system.	Students gather information and develop presentations describing evidence that gravity controls the motion of the planets around the sun.
Technology and Engineering	**Technology and Engineering**
Students learn engineering separately from other STEELS disciplines.	Students consider or apply engineering design principles throughout each STEELS course.
Engineering lessons are offered only to some students.	Technology and engineering lessons are offered to all students and each student is encouraged to connect lessons to their own personal experiences.
Students use trial and error to build a bridge out of popsicle sticks.	Students research various bridge designs, select a design that best aligns to their scientific knowledge about forces, and finally test their selected design.
Environmental Literacy and Sustainability	**Environmental Literacy and Sustainability**
Instruction consists of students only reading a textbook and answering questions about general science topics related to the environment.	Students gather, read, and synthesize information from multiple sources to investigate how Pennsylvania environmental issues affect Pennsylvania's human and natural systems.
Students learn what crops generally need to thrive without local application or problem-solving.	Students design a solution to the issue of local wheat crops suffering due to increased heatwaves, including solutions in which individuals and societies can engage as stewards of the environment.
Students watch a video about how watersheds work and take notes.	Students develop a model of the local watershed and wetland to help identify a solution to an erosion problem.

How Can You Support Your Child's Success?

This new approach to teaching and learning is different than what it was in the past and you can actively support your child's success in the classroom!

1. Speak to your child's teacher(s) or administrator about how these important changes will affect instruction and assessment.
2. Check with your child's teacher(s) about the topics they're learning at school and what activities or related books you can read with your child to reinforce STEELS Standards learning at home.
3. Encourage your child to explore, experiment, and ask questions at home or in your neighborhood.