

Teaching with the STEELS Practices

Presentation to the Board
of School Directors

April 22, 2025

STEELS Standards

Science

Life Science focuses on patterns, processes, and relationships of living organisms.

Physical Science focuses on what everything is made of and interactions.

Earth & Space Science focuses on processes that operate on Earth and its place in the solar system and galaxy.

Tech & Engineering

Focuses on the interactions among **technology, engineering**, society, the environment, and other disciplines, with a goal of developing individuals that can create, utilize, and assess current and emerging technologies.

Environmental Literacy & Sustainability

Focuses on ecological processes, and systems that comprise the environment, including human social systems and influences. **Sustainability** is the balanced use of natural / renewable resources.

Sustainable practices seek to ensure the integrity of ecological function and species diversity, with consideration for environmental justice, equity, and economic stability for current / future generations.

Phenomena-Driven Instruction

**Science is the practice of
developing evidence-based
explanations of phenomena in
the natural world**

“Moving from science as product to science as a practice.”

What is Phenomena?

“Natural phenomena are observable events that occur in the universe and that we can use our science knowledge to explain or predict.

The goal of...science is to develop general ideas, based on evidence, that can explain and predict phenomena.

...In this way, phenomena are the context for the work of...the scientist.”

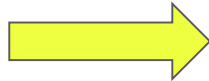
Phenomena-Driven vs Topic Organization

Topic Organization



Coherent to people who already know the topics (e.g. we do genetics before cells so students can better understand the role of DNA in the cell)

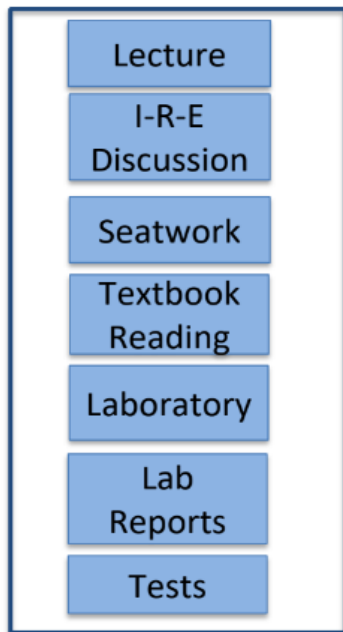
Phenomenon Organization



Adds coherence and a "why" for the learning for the students.

Shifts in the Classroom

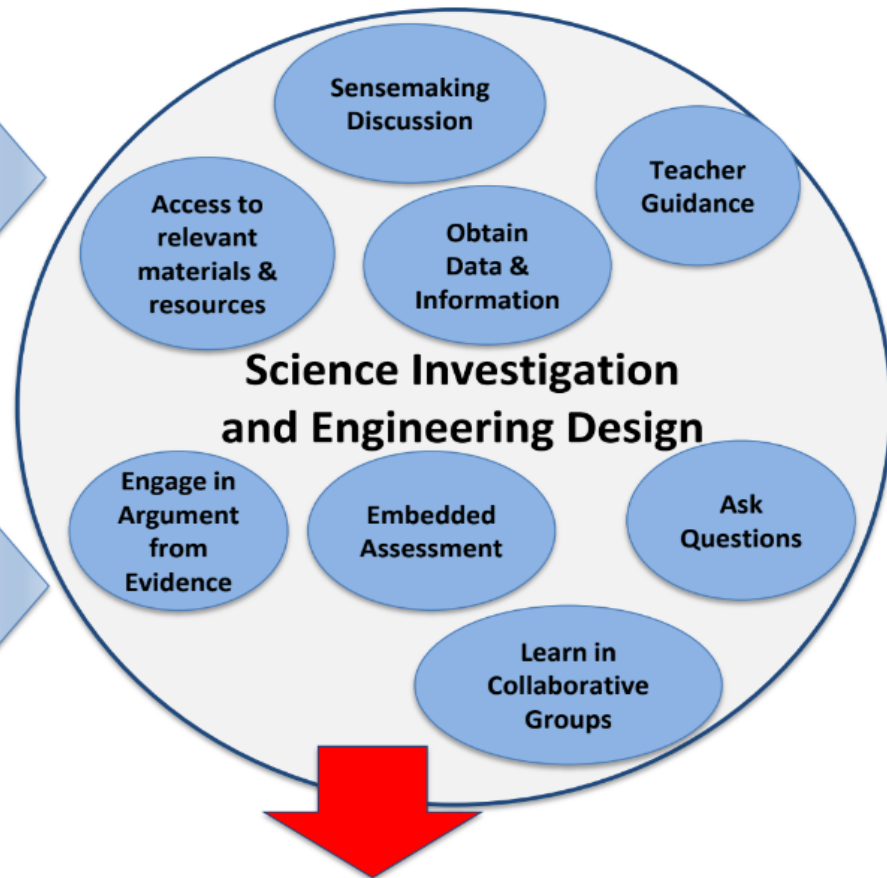
Traditional Science Classroom Activities



Knowledge of
vocabulary,
facts, and concepts

Shift

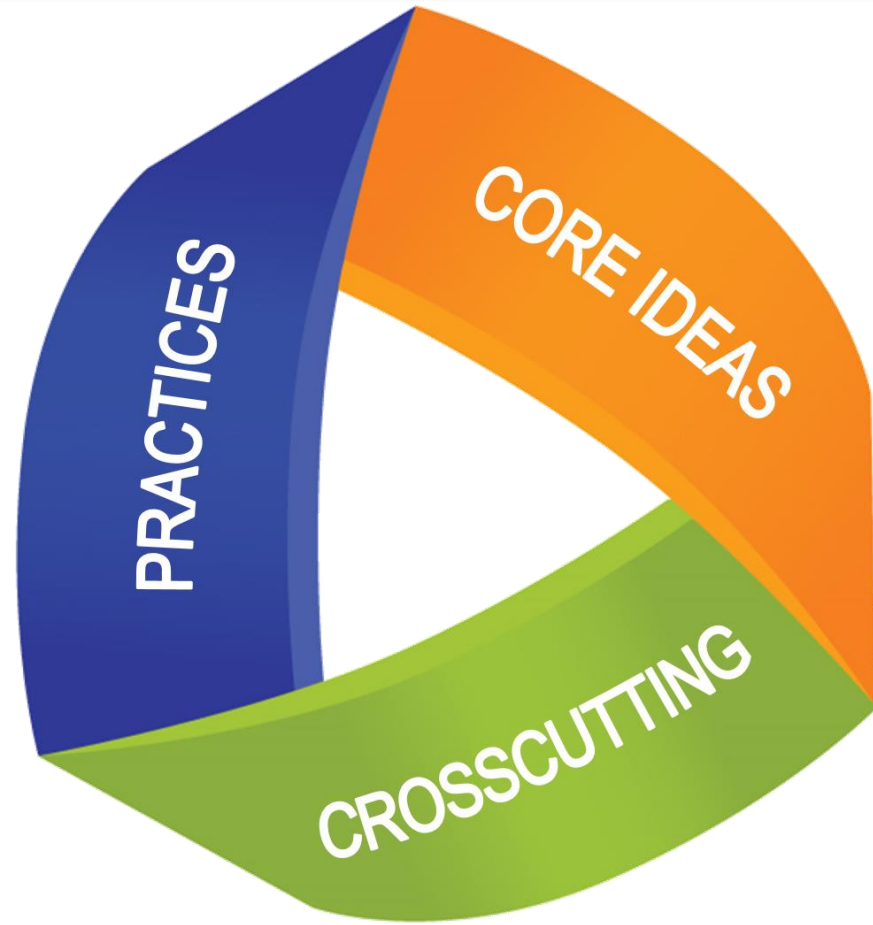
Shift



Three-dimensional student learning to make sense of
the natural and engineered world

Instructional Shifts in the Classroom

Three
Dimensional
Framework.





Science & Engineering Practices

SEPs are the **behaviors** that students engage in every day, just like scientists, to acquire skills that can be applied in all areas of STEELS.

SCIENCE & ENGINEERING PRACTICES



Asking Questions



**Planning and
Carrying Out
Investigations**



**Analyzing and
Interpreting Data**



**Developing and
Using Models**



**Using Mathematics
and Computational
Thinking**



**Constructing
Explanations**



**Engaging in
Argument from
Evidence**



**Obtaining, Evaluating
& Communicating
Information**

What Students DO



Crosscutting Concepts

CCCs represent the abstract **themes** that appear again and again throughout the scientific disciplines. These concepts are how students make sense of the phenomena around them.

How Students **THINK**



Disciplinary Core Ideas

DCIs represent **content knowledge** or big ideas. The topic concepts will stay the same but develop in complexity with each grade level.

What Students KNOW

Implications for Instruction

Old Model of Instruction



New Model of Instruction



Investigation = engage in the SEPs

The Old vs. The New Standards

Legacy Standards

- Explain 72
- Describe 65
- Identify 42
- Recognize 24
- Demonstrate 16
- Differentiate 13
- Examine 10

STEELS Standards

- Develop/Use Models 46
- Construct Argument 22
- Conduct Investigation 18
- Analyze Data 16
- Make/Use Observations 14
- Mathematical Representation 11

Practices not practice

A focus on practices (in the plural) avoids the mistaken impression that there is one distinctive approach common to all science—a single “scientific method.”

- *National Academies of Sciences, Engineering, and Medicine. 2019. A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press.*





FROM PROFESSIONAL LEARNING TO PUBLICATION

ASHLEY ALVERANGA AND BARBI GRIFFITH

WORKSHOP PARTICIPATION

*Engaging Students in Science Investigations –
Chemistry with Brett Moulding at MCIU*

COLLABORATION

Partnering with Brett Moulding to develop
phenomena-based lessons

LESSON DELIVERY

Engaging students in instruction

PUBLISH

- Publication of lesson(s) on Brett Moulding's website: [#Going3Dw/GRC](#)
 - Fireworking Our Way to Electron Configuration
 - Let's Glow



HS GRC Lessons- Physical Science



[CSSS Guidance Document "Investigation Beyond the Classroom"](#)

[Link to GRC Professional Development](#) Brett Moulding - BrettDMoulding@gmail.com

HS Physical Science (PS) Standard	Link to Lesson	State	Lesson Topic	Phenomenon	Lesson GRC or 5E	Notes
HS-PS1-1 <i>Periodic table as a model to predict properties</i>	"Fireworking Our Way to Electron Configuration"	PA	Electron Configuration and Properties of Elements	<i>Phenomenon: The fireworks we saw on the 4th of July were pink and yellow.</i>	GRC PIP	The investigation engages students in doing flame tests and connecting them to electron configuration. <i>Includes formative assessment</i>
HS-PS1-5 <i>Rates of Chemical Reactions</i>	Let's Glow!	PA	Temperature and rate of reaction.	<i>Phenomenon: Glow sticks are brighter on a warm night than on a cold night.</i>	GRC PIP	<i>This investigation uses glow sticks to explore rates of chemical reaction.</i> <i>Includes formative assessment</i>

STEELS Professional Learning in 2024-25

- K-8 Pilot Teacher Kit Training
- MCIU Professional Learning for Grades 5-12
 - Facilitated by Patrice Semicek and Andrew Kuhn (Montgomery County Intermediate Unit)
 - Key Concepts:
 - Science and Engineering Practices
 - Cross-Cutting Concepts
 - Planetarium Experience (facilitated by Adam Chantry)
 - 3 Dimensional Wrap-Up

Professional Development for STEELS

- Tuesday, May 20th – Amplify K-6 and Lab Aids Gr. 7-8 Kit Training, Grades 9-12 New Resource Training
- Summer MIAC opportunities
- August, October, and February In-Service Days
- Department and Grade Level Meetings
- Google Shared Drives for collaboration



**THANK
YOU**