Teaching and Learning Report: Science

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Agenda:

- State Standards
  - Where are we with Standards and Instruction Review Cycle (SIRC) in relation to new standards?
- Student Data
  - MCA
  - Local Assessments
- Curriculum Pathways
  - Elementary Curriculum Pathway
  - Secondary Curriculum Pathway

State Standards

The 2019 Minnesota Science Standards guide our K-12 science education. They aim to develop scientifically literate students who can apply scientific knowledge to real-world situations and be prepared for future careers. These standards are based on national research and emphasize hands-on learning, critical thinking, and a comprehensive understanding of science through three key areas: scientific practices, crosscutting concepts, and core ideas.

	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
Science MCA-IV in 2024-25	MDE Delay	Grade 3 FY Soft rollout	Grades 4-5 FY Soft Rollout	MCA-IV	K-5 SIY 1	K-5 SIY 2	K-5 CI 1	K-5 CI 2	K-5 CI 3
				K-2 FY					
		6-12 TLS Prep	6 and 9 SIY1	6 and 9 SIY2	6 and 9 CI 1	6 and 9 CI 2	6 and 9 CI 3	6 and 9 CI 4	6 and 9 CI 5
			7-8, 10-12 FY	7-8, 10-12 SIY1	7-8, 10-12 SIY2	7-8, 10-12 CI 1	7-8, 10-12 CI 2	7-8, 10-12 CI 3	7-8, 10-12 CI 4

KEY:

- **TLS Prep** Standard Review and Research
- **FY** Focus Year: SIRC Teams Convened
- **SIY 1** Systemic Implementation Year 1 SSP Team
- **SIY 2** Systemic Implementation Year 2 SSP Team
- **CI 1-3** Continuous Improvement Years
- **CI 4-6** Continuous Improvement Years

State Standards

Three Dimensions Summary

Dimension 1: Science and Engineering Practices
This dimension focuses on the important, everyday practices used by scientists and engineers, which all students should learn to use with increasing sophistication over their years in school.

Dimension 2: Crosscutting Concepts
This dimension lists key concepts, or themes, which connect knowledge from the various disciplines of science and engineering into a coherent scientific view of the world.

Dimension 3: Disciplinary Core Ideas
This dimension includes the core ideas from the physical sciences, life sciences, and earth and space sciences. Engineering, technology, and applications of science are included to provide an understanding of the built world.

State Standards

Grade	Strand	Substrand	Standard	Content Area	Benchmark
5	1 Exploring phenomena or engineering problems	1.2 Planning and carrying out investigations	1.2.1 Students will be able to design and conduct investigations in the classroom, laboratory, and/or field to test students' ideas and questions, and will organize and collect data to provide evidence to support claims the students make about phenomena.	Life Science	***5L.1.2.1.3*** Plan and conduct an investigation to obtain evidence that plants get the materials they need for growth chiefly from air and water. ***(P: 3, CC: 5, CI: LS1)*** .

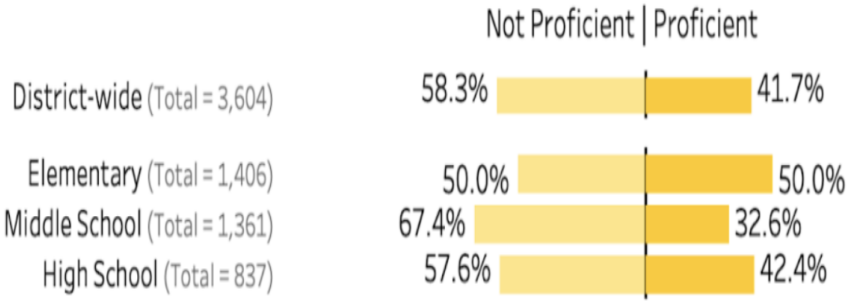
Grade	Strand	Substrand	Standard	Content Area	Benchmark
9-12 Earth and Space Science	1 Exploring phenomena or engineering problems	1.1 Asking questions and defining problems	1.1.1 Students will be able to ask questions about aspects of the phenomena they observe, the conclusions they draw from their models or scientific investigations, each other's ideas, and the information they read.	ESS: Earth's Systems	9E.1.1.1.1 Ask questions to clarify how seismic energy traveling through Earth's interior can provide evidence for Earth's internal structure. (P: 1, CC: 6,CI: ESS2)

What Does the Data Tell Us?

- MCA (5th, 8th, 9th-12th)
- Pre-ACT (10th)
- ACT (11th)

What Does the Data Tell Us?

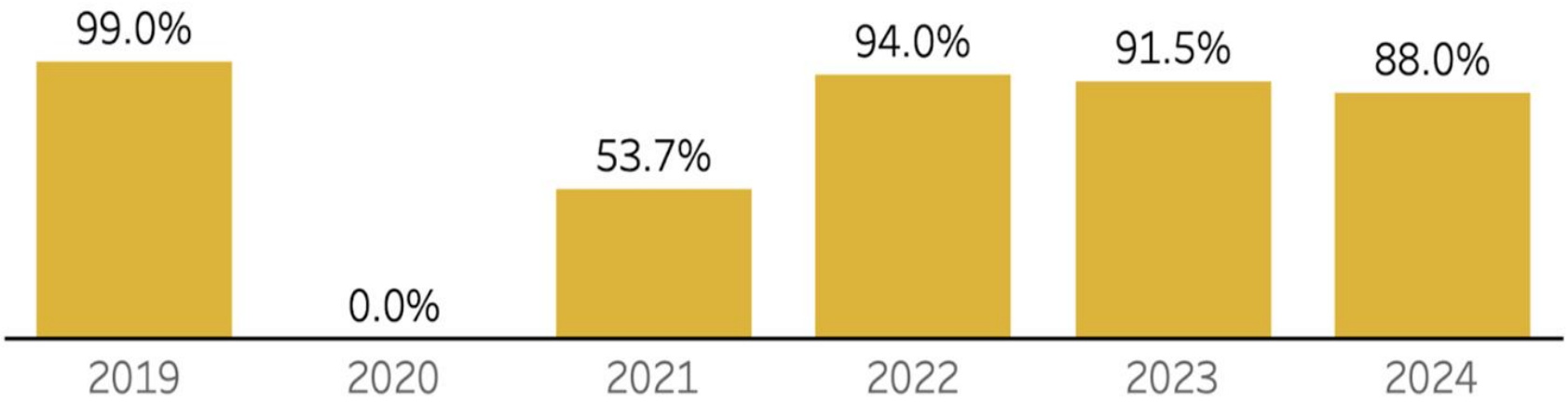
MCA Science



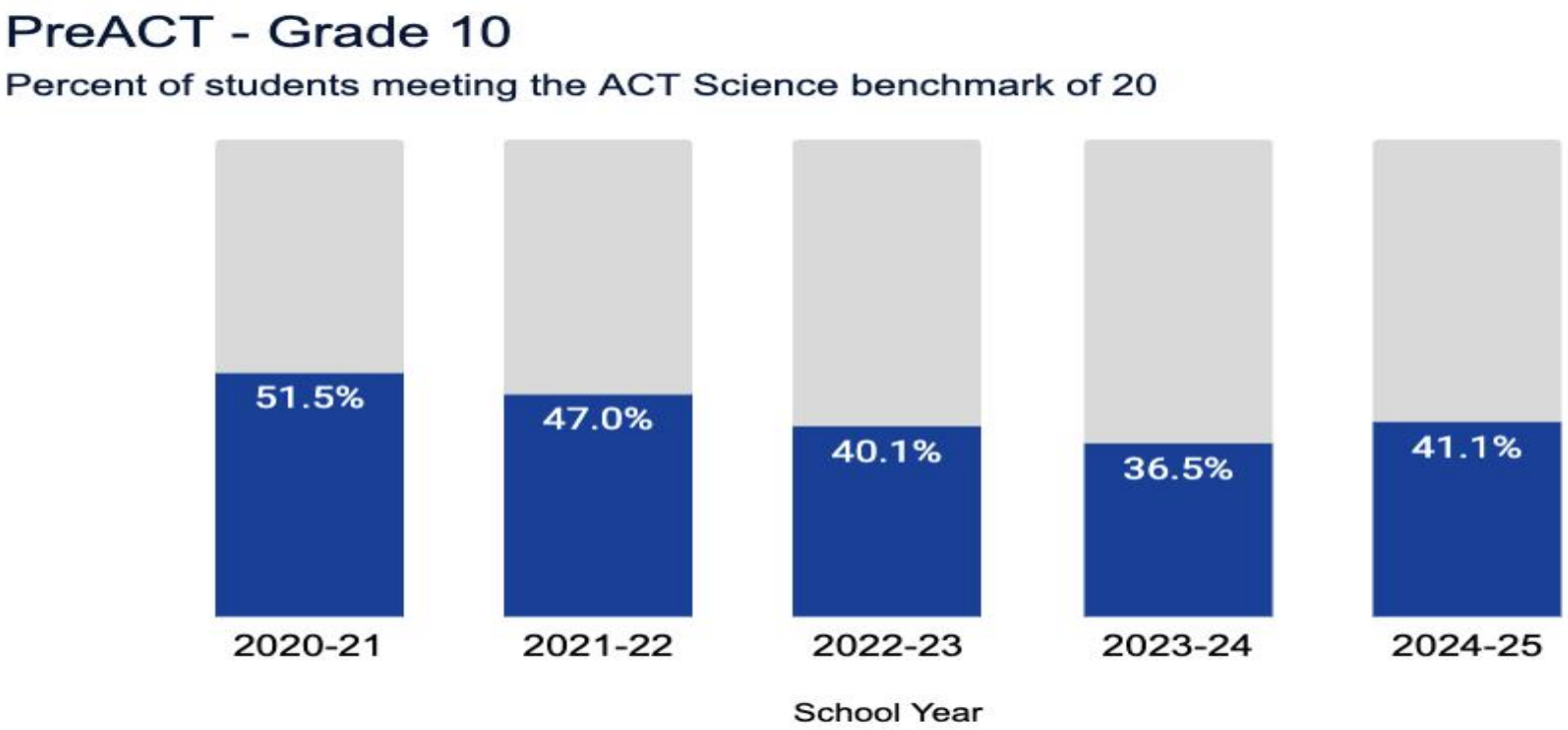
MDE State numbers for science 2024:
Statewide (total=176,724): Not Proficient: 60.4% Proficient: 39.5%
Elementary (5th grade, total=61,519): Not Proficient: 55%, Proficient: 45%
Middle School (8th grade, total=59,838): Not Proficient:69.7%, Proficient: 30.4%
High School (total=55,367): Not Proficient: 56.5%, Proficient: 43.5%

What Does the Data Tell Us?

MCA: Science Participation Rates

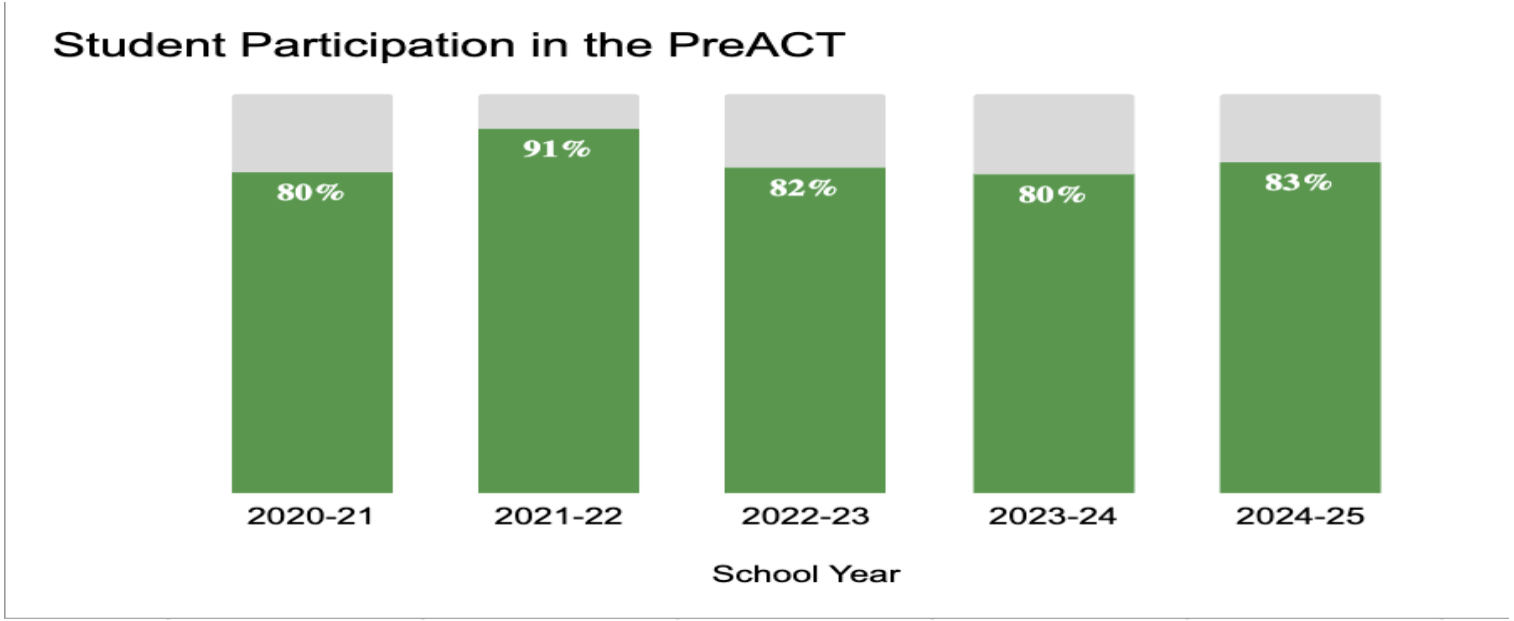


What Does the Data Tell Us?



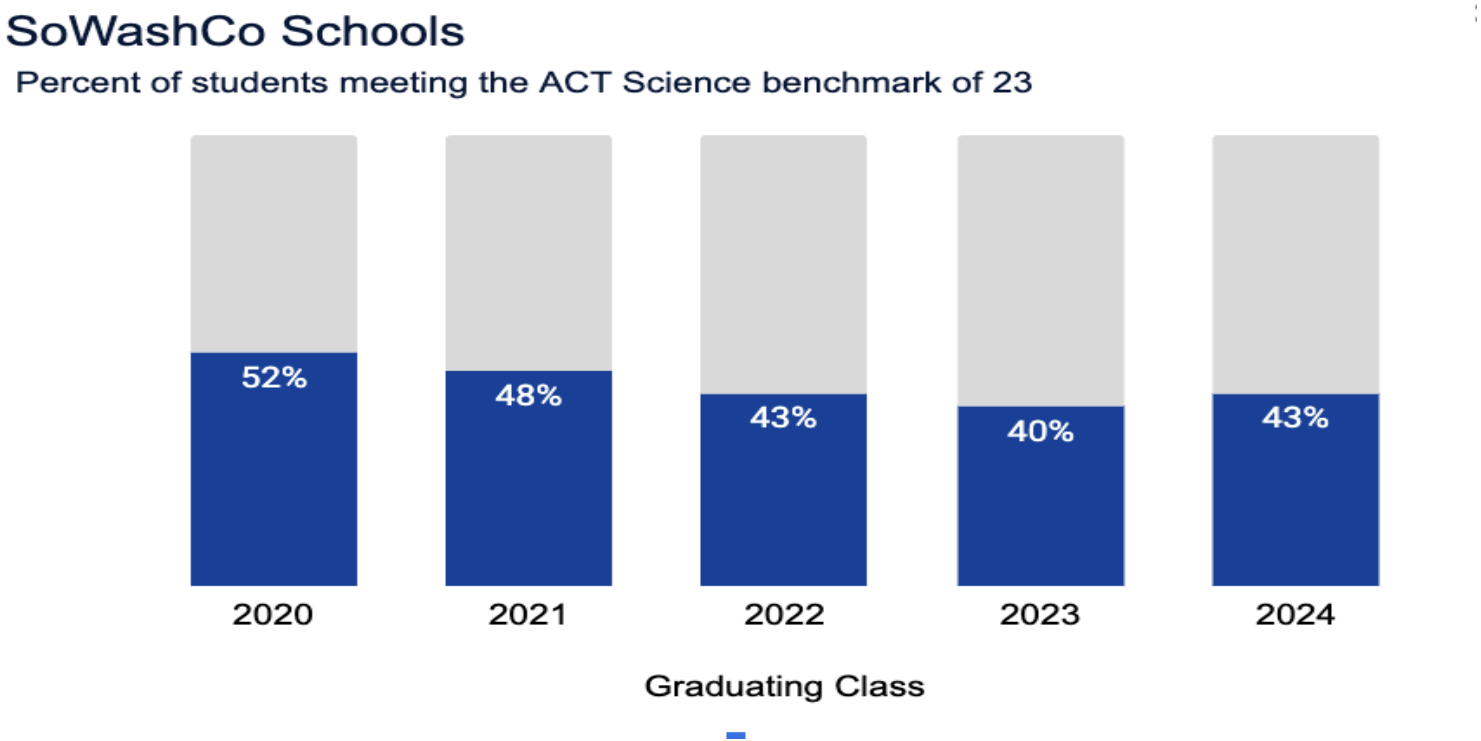
What Does the Data Tell Us?

Pre-ACT: Participation Rates (10th grade)

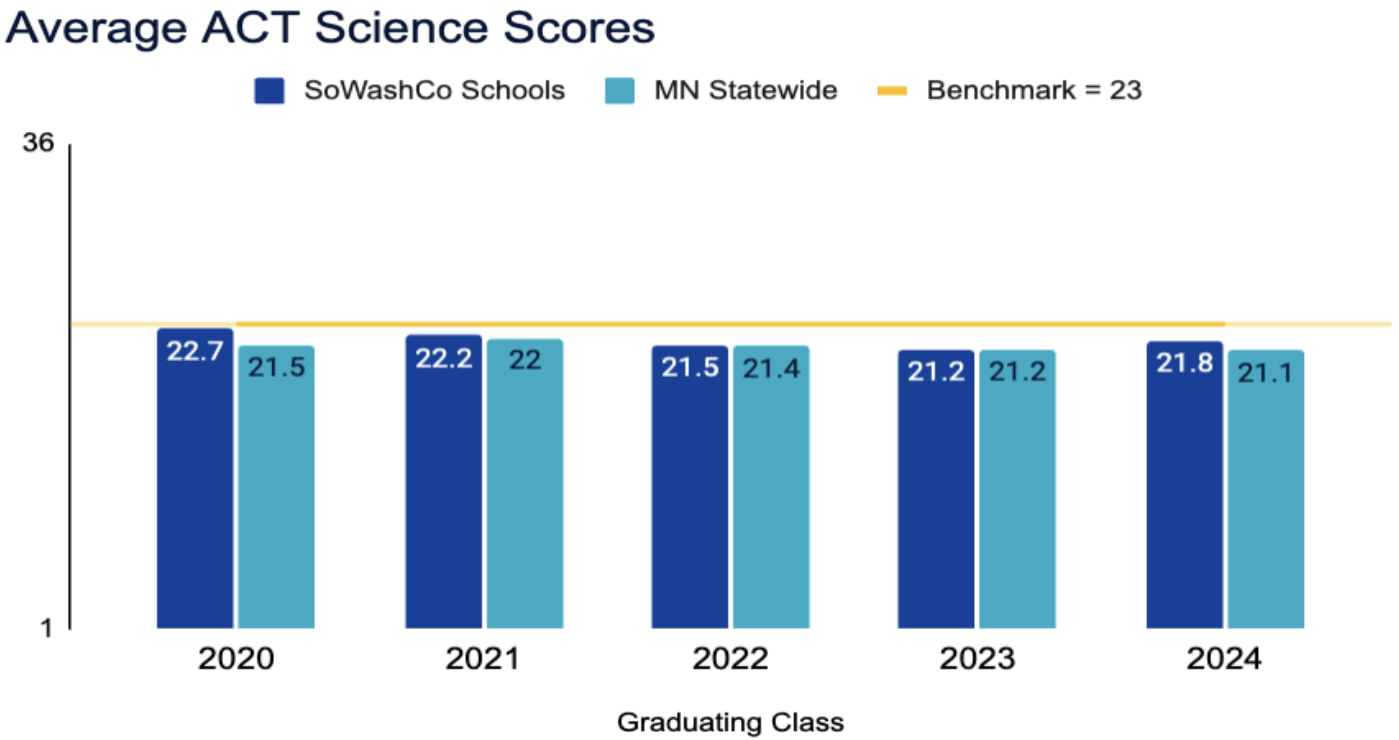


What Does the Data Tell Us?

ACT (11th grade)



What Does the Data Tell Us?



K-5 Curriculum
Elementary

Through the eyes of our elementary students...

Guiding Questions

- What matter do plants need to grow?
- How does matter move within an ecosystem?
- How does energy move within an ecosystem?

Anchor Phenomenon: "an observable event that occurs in the universe and that we can use our science knowledge to explain or predict." (as defined by Next Generation Science Standards or NGSS)

Elementary Science in Action

Kindergarten – 2nd Grade

Grade K

LIFE SCIENCE & EARTH SCIENCE
Plant and Animal Needs

33 Days

EARTH SCIENCE
Living Things and the Environment

42 Days

EARTH SCIENCE AND PHYSICAL SCIENCE
Weather and Shelter

35 Days

PHYSICAL SCIENCE
Motion and Change

35 Days

Grade 1

LIFE SCIENCE & EARTH SCIENCE
Plant Shapes

38 Days

LIFE SCIENCE & EARTH SCIENCE
Animal Sounds

31 Days

EARTH SCIENCE AND PHYSICAL SCIENCE
Shadows, Light, Motion in the Sky

60 Days

Grade 2

EARTH SCIENCE
Landscape Shapes

46 Days

PHYSICAL SCIENCE
Materials from the Land

60 Days

EARTH SCIENCE
How Landscapes Change

32 Days

LIFE SCIENCE
Biodiversity in Habitats

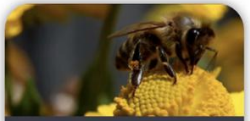
35 Days

3rd – 5th Grade

Grade 3

PHYSICAL SCIENCE
Playground Forces

*47 Sessions**



LIFE SCIENCE
Life Cycles for Survival

42 Sessions

LIFE SCIENCE
Surviving in Changing Environments

57 Sessions

EARTH SCIENCE
Weather Impacts

44 Sessions

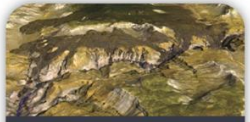
Grade 4

PHYSICAL SCIENCE
Car Crashes

58 Sessions

EARTH AND PHYSICAL SCIENCE
Energy Resources

69 Sessions



EARTH SCIENCE
Earth's Changing Surface

63 Sessions

EARTH AND PHYSICAL SCIENCE
Earthquakes

48 Sessions

LIFE AND PHYSICAL SCIENCE
Senses and Survival

44 Sessions

Grade 5

PHYSICAL SCIENCE
What is Matter Made Of?

48 Sessions

LIFE AND PHYSICAL SCIENCE
From Matter or Organism

46 Sessions

EARTH SCIENCE
Interacting Earth Systems

44 Sessions

EARTH AND PHYSICAL SCIENCE
Patterns in the Night Sky

43 Sessions

Through the eyes of elementary staff...

Grade	Strand	Substrand	Standard	Content Area	Benchmark
5	1 Exploring phenomena or engineering problems	1.2 Planning and carrying out investigations	1.2.1 Students will be able to design and conduct investigations in the classroom, laboratory, and/or field to test students' ideas and questions, and will organize and collect data to provide evidence to support claims the students make about phenomena.	Life Science	5L.1.2.1.3 Plan and conduct an investigation to obtain evidence that plants get the materials they need for growth chiefly from air and water. (P: 3, CC: 5, CI: LS1)

5th Grade Example

Unit Storyline

In this unit, students use what they know about the needs of living things to build a model of an ecosystem. To develop this model, students begin by investigating the plant producers at the bottom of the food chain. They accumulate evidence to support an argument that plants get materials they need for growth from air and water. Then, they explore food chains and food webs to build model that describes the movement of these materials among plants, animals, decomposers, and the environment. Students realize that, to use these materials, animals extract energy from food, and this energy is the same energy that plants obtain from the sun. Finally, students design and construct a model ecosystem that represents this flow of matter and energy.

Anchor Phenomenon: Get Started

Food Chains and Food Webs
Students will develop models to show the flow of materials and energy through an ecosystem and use their models to explain how different organisms are interconnected.

Unit Project Preview

Build a Mini-Ecosystem
Students will use this Unit Project to construct a mini-ecosystem to demonstrate their knowledge of the interactions and energy flow within an ecosystem.

Concepts

2.1 Plant Needs
Students will learn that plants use energy from the sun, air, and water to manufacture food for themselves.

2.2 Matter Flow in Ecosystems
Students will learn that food chains and food webs are models that show consumption relationships in an ecosystem.

2.3 Energy Flow in Ecosystems
Students will learn how the energy provided by the sun flows through plants and animals.

Unit Project

Build a Mini-Ecosystem
In this project, students will have the opportunity to apply what they have learned about ecosystems and energy flow within ecosystems to build their own mini-ecosystem.

Unit Performance-Based Assessment

How Does Your Garden Grow?
In this activity, students are presented with text and videos related to a garden ecosystem and its flow of energy and matter. Students must support the argument that plants get the materials they need for growth chiefly from air and water.

Guiding Questions

1. What matter do plants need to grow?
2. How does matter move within an ecosystem?
3. How does energy move within an ecosystem?

Unit Project Preview

Build a Mini-Ecosystem

Introduce students to the project for the unit. Students can record their initial ideas and return to their ideas at the end of the unit and return to their ideas at the end of the unit.

Quick Code: us5256st

Question

- What do you know about an ecosystem?

NGSS Dimension	Concept 2.1 Plant Needs
Science and Engineering Practices (SEP)	
SEP Asking Questions and Defining Problems	•
SEP Developing and Using Models	•
SEP Planning and Carrying Out Investigations	•
SEP Analyzing and Interpreting Data	•
SEP Constructing Explanations and Designing Solutions	•
SEP Engaging in Argument from Evidence	•
SEP Obtaining, Evaluating, and Communicating Information	•
Disciplinary Core Ideas (DCI)	
DCI LS1.C Organization for Matter and Energy Flow in Organisms	•
Crosscutting Concepts (CCC)	
CCC Patterns	
CCC Energy and Matter	
CCC Structure and Function	•

Concept 1: Plant Needs 5-LS1-1 Support an argument that plants get the materials they need for growth chiefly from air and water. **Concept 2: Matter Flow in Ecosystems** 5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. **Concept 3: Energy Flow in Ecosystems** 5-PS3-1 Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.	**Grade K** K.LS1.C **Grade 2** 2.LS2.A; 2.LS4.D; 2.PS1.A **Grade 4** 4.ESS2.E; 4.PS3.A; 4.PS3.B; 4.PS3.D **Middle School** MS.PS3.D; MS.LS1.C; MS.LS2.A; MS.LS2.B; MS.PS4.B

6-12 Curriculum
Secondary

Science in action in our schools.

Note the 4 Strands and 8 Substrands in action...

There is an intentional focus on developing Scientific thinking.

1. Exploring phenomena or engineering problems.

    1.1. Asking questions and defining problems
    1.2. Planning and carrying out investigations

1. Looking at data and empirical evidence to understand phenomena or solve problems.

    2.1. Analyzing and interpreting data
    2.2. Using mathematics and computational thinking

Science in action in our schools.

Note the 4 Strands and 8 Substrands in action...

There is an intentional focus on developing Scientific thinking.

3. Developing possible explanations of phenomena or designing solutions to engineering problems.

    3.1. Developing and using models
    3.2. Constructing explanations and designing solutions

3. Communicating reasons, arguments and ideas to others.

    4.1. Engaging in arguing from evidence
    4.2. Obtaining, evaluating and communicating information

Second

A few highlights to discuss from what we saw today.

Phenomena, or topics observed

Grade level and content area	Phenomena - or topic
6th Grade Earth & Space Science	***What is a summer or winter solstice?*** ***What is an equinox?*** ***How do these phenomena relate to seasons?***
7th Grade Life Science*	
8th Grade Physical Science	
9th Grade Earth & Space Science	

Note:

- **The solstice is when the sun is observed to be at the highest or lowest point in the sky aligning with the longest or shortest day of the year.**
- **The equinox is halfway point between the solstices, approximately 12 hours of both daylight and night.**

A few highlights to discuss from what we saw today.

Phenomena, or topics observed

Grade level and content area	Phenomena - or topic
6th Grade Earth & Space Science	***What is a summer or winter solstice?*** ***What is an equinox?*** ***How do these phenomena relate to seasons?***
7th Grade Life Science*	***Description of Claim, Evidence, Reasoning (CER)***
8th Grade Physical Science	
9th Grade Earth & Space Science	

Note:

- **A Claim is an initial inquiry, or explanation by students about data, a phenomenon, or experiment.**
- **Evidence is gathered while conducting a trial, or following an observation.**
- **Reasoning is based on a claim, or revised claim, and the evidence gathered.**

A few highlights to discuss from what we saw today.

Phenomena, or topics observed

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7th Grade Life Science*	***Description of Claim, Evidence, Reasoning (CER)***
8th Grade Physical Science	***Roller coaster investigation on Kinetic & Potential Energy***
	Types of energy - Newton's cradle & solar powered sloth
9th Grade Earth & Space Science	

Note:

- **Kinetic Energy is mathematically described as K.E. = ½ m v^2**
- **Potential Energy is mathematically described as P.E. = mgh**

A few highlights to discuss from what we saw today.

Phenomena, or topics observed

Grade level and content area	Phenomena - or topic
6th Grade Earth & Space Science	***What is a summer or winter solstice?*** ***What is an equinox?*** ***How do these phenomena relate to seasons?***
7th Grade Life Science*	***Description of Claim, Evidence, Reasoning (CER)***
8th Grade Physical Science	***Roller coaster investigation on Kinetic & Potential Energy***
	Types of energy - Newton's cradle & solar powered sloth
9th Grade Earth & Space Science	***National Park Presentation - How and where unique landforms are observed and the earth systems that created them.***

Note:

- **Erosion wears down, destroys, or removes material through natural processes typically based on wind, water, or other material physically moving.**
- **Deposition is the accumulation of material following erosion.**

A few highlights to discuss from what we saw today.

The 8 Substrands of the Science Standards (Science & Engineering Practices)

1.1. Asking questions and defining problems

- 6th, 7th, 8th, & 9th

1.2. Planning and carrying out investigations

- 6th, 7th, 8th, & 9th

2.1. Analyzing and interpreting data

- 6th, 8th, & 9th

2.2. Using mathematics and computational thinking

- 8th

3.1. Developing and Using Models

- 6th, 8th, & 9th

6th – 8th Grade: *Middle School Science*

6th Grade Earth and Space Science


Dead Fish in the Delta


Superstorm of 1993


Dogsled Race


Ever-Changing Moon


Puerto Rico Earthquake

7th Grade Life Science


Healing Cut


Kelp Forest


Zebra Survival


Albino Squirrels


Mystery Fossil


Hawaiian Flies

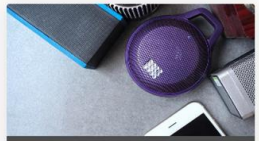
8th Grade Physical Science


Hindenburg Explosion


Rocket Sled


Air Conditioner

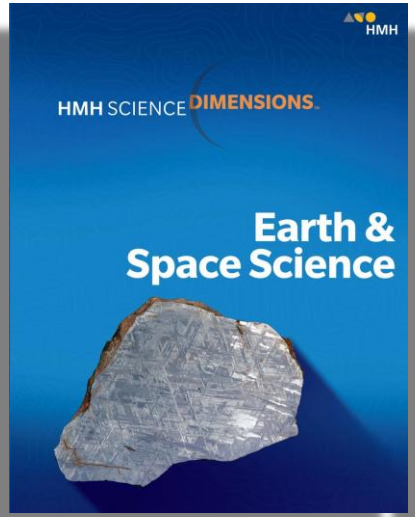

Levitating Forces


Wireless Speaker

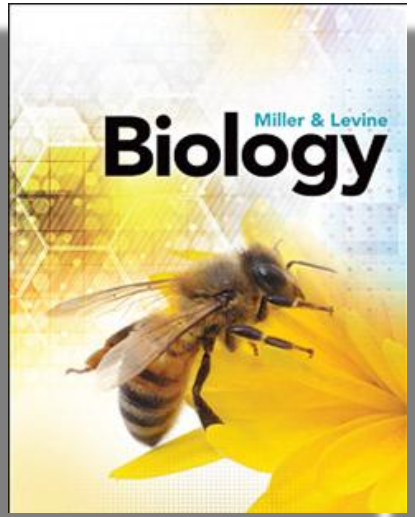
9th – 12th Grade: *High School Science*

Traditional Pathway for Science

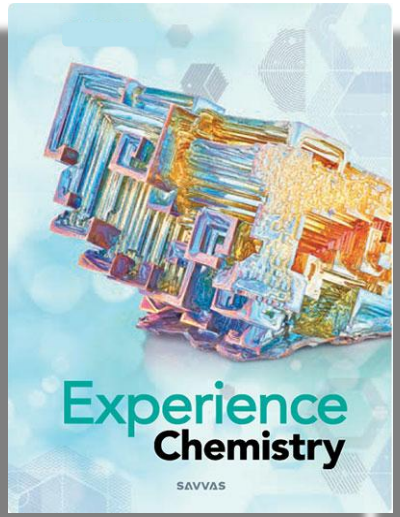
9th Grade



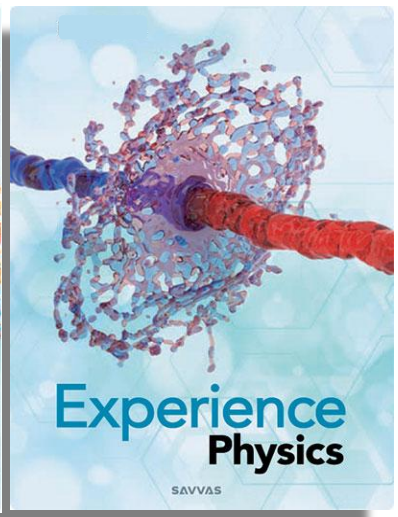
10th Grade



11th Grade



12th Grade



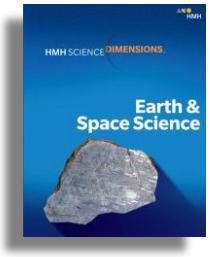
3 years of science are required for graduation

Earth & Space • Life • Physical

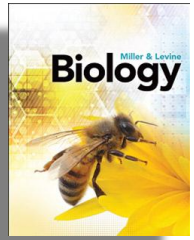
9th – 12th Grade: *High School Science*

Alternate Pathways

9th Grade

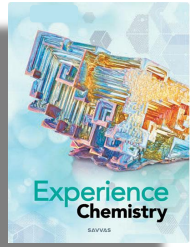


10th Grade



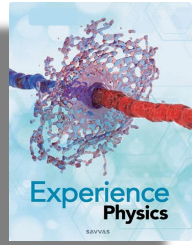
AP Biology
IB Biology 1 → IB Biology 2

11th or 12th Grade



Honors Chem
IB Biology 2
IB Chemistry 1 → IB Chemistry 2
AP Chemistry
AP Physics 1 → AP Physics 2

11th or 12th Grade



Anatomy & Physiology
IB Sports Exercise & Health Sciences
IB Chemistry 2
IB Physics
AP Physics 2
AP Environmental Science

3 years of science are required for graduation
Earth & Space • Life • Physical

Questions?