

MODULES	MODULE PHENOMENON	STORYLINE	PERFORMANCE EXPECTATIONS (*PEs that integrate traditional science content with engineering through SEPs or DCIs)
1: Matter Mysteries Hotline NGSS Topic Arrangements: Structure and Properties of Matter; Engineering Design 	What is matter made of?	Got a science mystery you need to solve? Then call the Matter Mysteries Hotline—a one-stop service for people in need of specialist scientific help. As trainee recruits, students use their science skills to answer a series of matter-related queries. They test mystery materials to help a private investigator, choose the best materials to make an explorer's kit bag, investigate chemical reactions when a Fire and Rescue team find an unidentified substance in a school, and help a Hollywood special effects department create the perfect clay. Let's find out why matter matters!	<p>5-PS1-1 Develop a model to describe that matter is made of particles too small to be seen.</p> <p>5-PS1-2 Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.</p> <p>5-PS1-3 Make observations and measurements to identify materials based on their properties.</p> <p>5-PS1-4 Conduct an investigation to determine whether the mixing of two or more substances results in new substances.</p> <p>3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.</p>
2: Yellowstone: Uncovered NGSS Topic Arrangements: Matter and Energy in Organisms and Ecosystems 	How do matter and energy move through an ecosystem?	Yellowstone is one of the United States' largest and wildest national parks—and you're about to see a side of it that isn't on the tourist trail! Students become park rangers to investigate how matter and energy move through systems. They observe predators hunting prey, discover the organisms that recycle the dead, and learn how plants create their own food. As students explore the relationships between the plants and animals that live in Yellowstone, they discover how even small changes to an environment can have big impacts.	<p>5-LS1-1 Support an argument that plants get the materials they need for growth chiefly from air and water.</p> <p>5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.</p> <p>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.</p>
3: H2O Response Team NGSS Topic Arrangements: Earth's Systems; Engineering Design 	What can we do to protect Earth's systems?	Welcome to the H2O Response Team! Students become hydrologists, tasked with investigating the growing issue of water scarcity. Students explore where water is found around the world, and discover just how little of it is drinkable. They investigate the many ways we use water, and consider the threat posed by water shortages—including droughts in California. Students then use what they've learned about sustainability to devise and implement a water campaign. Remember: every drop counts!	<p>5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.</p> <p>5-ESS2-2 Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.</p> <p>5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.</p> <p>3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.</p> <p>3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.</p> <p>3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.</p>
4: Galactic Guidebook NGSS Topic Arrangements: Space Systems 	What patterns do we notice when we observe the stars?	Students join a community of international star-spotters, and report on the patterns they see in the night sky. They investigate why some stars are brighter than others, why we only see them at night, and how stars seem to move across the sky. They discover how the night sky can be used for navigation, explore the constellations, and investigate why we don't fall off the Earth! Using these explorations and observations, students create their own Galactic Guidebook—a record of patterns in the sky and in their own lives. It'll be out of this world!	<p>5-PS2-1 Support an argument that the gravitational force exerted by Earth on objects is directed down.</p> <p>5-ESS1-2 Represent data in graphical displays to reveal patterns of daily changes in the length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.</p> <p>5-ESS1-1 Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distance from Earth.</p>



CROSS-CURRICULAR CONNECTIONS

Crosscutting Concepts
CCC-2 Cause and Effect
CCC-3 Scale, Proportion, and Quantity
CCC-5 Energy and Matter
CCC-6 Structure and Function

Disciplinary Core Ideas
PS1.A Structure and Properties of Matter
PS1.B Chemical Reactions

Engineering, Technology, and Applications of Science
ETS1.B Developing Possible Solutions
ETS1.C Optimizing the Design Solution

Science and Engineering Practices
SEP-2 Developing and Using Models
SEP-3 Planning and Carrying Out Investigations
SEP-4 Analyzing and Interpreting Data
SEP-5 Using Mathematics and Computational Thinking
SEP-6 Constructing Explanations and Designing Solutions
SEP-7 Engaging in Argument from Evidence
SEP-8 Obtaining, Evaluating, and Communicating Information

Common Core English Language Arts
RI.5.1–3 Key Ideas and Details
RI.5.8 Integration of Knowledge and Ideas
RI.5.10 Range of Reading and Level of Text Complexity
SL.5.1–3 Comprehension and Collaboration
SL.5.5–6 Presentation of Knowledge and Ideas
W.5.1–2 Text Types and Purposes
W.5.4–5 Production and Distribution of Writing
W.5.7–9 Research to Build and Present Knowledge

WIDA English Language Development
Standard 1: Social and Instructional Language
Standard 2: The Language of Language Arts
Standard 3: The Language of Mathematics
Standard 4: The Language of Science

English Language Proficiency Domains
Speaking, Listening, Reading, Writing

Common Core Math
5.MD.A Convert like measurement units within a given measurement system
5.MD.B Represent and interpret data
5.MD.C Geometric measurement: understand concepts of volume
5.NBT.B Perform operations with multi-digit whole numbers and with decimals to hundredths
MP5 Use appropriate tools strategically
MP6 Attend to precision
MP8 Look for and express regularity in repeated reasoning

Crosscutting Concepts
CCC-2 Cause and Effect
CCC-3 Scale, Proportion, and Quantity
CCC-4 System and System Models
CCC-5 Energy and Matter
CCC-7 Stability and Change

Disciplinary Core Ideas
LS1.C Organization for Matter and Energy Flow in Organisms
LS2.A Interdependent Relationships in Ecosystems
LS2.B Cycles of Matter and Energy Transfer in Ecosystems
PS3.D Energy in Chemical Processes and Everyday Life

Science and Engineering Practices
SEP-1 Asking Questions and Defining Problems
SEP-2 Developing and Using Models
SEP-3 Planning and Carrying Out Investigations
SEP-4 Analyzing and Interpreting Data
SEP-5 Using Mathematics and Computational Thinking
SEP-6 Constructing Explanations and Designing Solutions
SEP-7 Engaging in Argument from Evidence
SEP-8 Obtaining, Evaluating, and Communicating Information

Environmental Principles and Concepts
Principle II People influence natural systems
Principle III Natural systems change in ways that people benefit from and can influence

Common Core English Language Arts
L.5.6 Vocabulary Acquisition and Use
RI.5.1–3 Key Ideas and Details
RI.5.4–6 Craft and Structure
RI.5.7–8 Integration of Knowledge and Ideas
RI.5.10 Range of Reading and Level of Text Complexity
SL.5.1–2 Comprehension and Collaboration
SL.5.5 Presentation of Knowledge and Ideas
W.5.1 Text Types and Purposes
W.5.4–5 Production and Distribution of Writing
W.5.8–9 Research to Build and Present Knowledge
W.5.10 Range of Writing

WIDA English Language Development
Standard 1: Social and Instructional Language
Standard 2: The Language of Language Arts
Standard 3: The Language of Mathematics
Standard 4: The Language of Science

English Language Proficiency Domains
Speaking, Listening, Reading, Writing

Common Core Math
5.NBT.B Perform operations with multi-digit whole numbers and with decimals to hundredths
5.MD.B Represent and interpret data
MP1 Make sense of problems and persevere in solving them.
MP3 Construct viable arguments and critique the reasoning of others
MP4 Model with mathematics
MP5 Use appropriate tools strategically

Crosscutting Concepts
CCC-1 Patterns
CCC-2 Cause and Effect
CCC-3 Scale, Proportion, and Quantity
CCC-4 System and System Models

Disciplinary Core Ideas
ESS2.A Earth Materials and Systems
ESS2.C The Roles of Water in Earth's Surface Processes
ESS3.C Human Impacts on Earth Systems

Engineering, Technology, and Applications of Science
ETS1.A Defining and Delimiting Engineering Problems
ETS1.B Developing Possible Solutions
ETS1.C Optimizing the Design Solution

Science and Engineering Practices
SEP-1 Asking Questions and Defining Problems
SEP-2 Developing and Using Models
SEP-3 Planning and Carrying Out Investigations
SEP-4 Analyzing and Interpreting Data
SEP-5 Using Mathematics and Computational Thinking
SEP-6 Constructing Explanations and Designing Solutions
SEP-8 Obtaining, Evaluating, and Communicating Information

Environmental Principles and Concepts
Principle I People depend on natural systems
Principle II People influence natural systems
Principle IV There are no permanent or impermeable boundaries that prevent matter from flowing between systems
Principle V Decisions affecting resources and natural systems are complex and involve many factors

Common Core English Language Arts
L.5.6 Vocabulary Acquisition and Use
RI.5.1–3 Key Ideas and Details
RI.5.4 Craft and Structure
RI.5.7–9 Integration of Knowledge and Ideas
RI.5.10 Range of Reading and Level of Text Complexity
SL.5.1–2 Comprehension and Collaboration
SL.5.4 Presentation of Knowledge and Ideas
W.5.2 Text Types and Purposes
W.5.5 Production and Distribution of Writing
W.5.7–9 Research to Build and Present Knowledge
W.5.10 Range of Writing

WIDA English Language Development
Standard 1: Social and Instructional Language
Standard 2: The Language of Language Arts
Standard 3: The Language of Mathematics
Standard 4: The Language of Science

English Language Proficiency Domains
Speaking, Listening, Reading, Writing

Common Core Math
5.NBT.A Understand the place value system
5.MD.A Convert like measurement units within a given measurement system.
MP2 Reason abstractly and quantitatively
MP4 Model with mathematics
MP5 Use appropriate tools strategically
MP6 Attend to precision

Crosscutting Concepts
CCC-1 Patterns
CCC-2 Cause and Effect
CCC-3 Scale, Proportion, and Quantity
CCC-4 System and System Models
CCC-7 Stability and Change

Disciplinary Core Ideas
PS2.B Types of Interactions
ESS1.A The Universe and Its Stars
ESS1.B Earth and the Solar System

Science and Engineering Practices
SEP-2 Developing and Using Models
SEP-3 Planning and Carrying Out Investigations
SEP-4 Analyzing and Interpreting Data
SEP-5 Using Mathematics and Computational Thinking
SEP-6 Constructing Explanations and Designing Solutions
SEP-7 Engaging in Argument from Evidence
SEP-8 Obtaining, Evaluating, and Communicating Information

Environmental Principles and Concepts
Principle I People depend on natural systems

Common Core English Language Arts
L.5.4, 6 Vocabulary Acquisition and Use
RI.5.1–3 Key Ideas and Details
RI.5.4 Craft and Structure
RI.5.8 Integration of Knowledge and Ideas
RI.5.10 Range of Reading and Level of Text Complexity
SL.5.1–2 Comprehension and Collaboration
SL.5.4–5 Presentation of Knowledge and Ideas
W.5.1–2 Text Types and Purposes
W.5.4–6 Production and Distribution of Writing
W.5.7–8 Research to Build and Present Knowledge
W.5.10 Range of Writing

English Language Proficiency Domains
Speaking, Listening, Reading, Writing

WIDA English Language Development
Standard 1: Social and Instructional Language
Standard 2: The Language of Language Arts
Standard 3: The Language of Mathematics
Standard 4: The Language of Science

Common Core Math
5.MD.B Represent and interpret data
5.NBT.A Understand the place value system
MP1 Make sense of problems and persevere in solving them
MP3 Construct viable arguments and critique the reasoning of others
MP4 Model with mathematics
MP6 Attend to precision
MP7 Look for and make use of structure

Performance Expectation Progressions

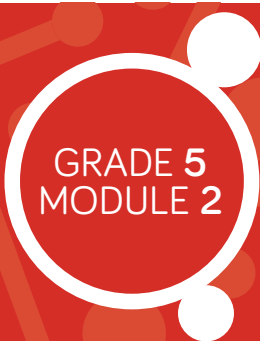
Matter Mysteries Hotline covers four NGSS Performance Expectations (PEs) in the Physical Sciences (5-PS1-1, 5-PS1-2, 5-PS1-3, and 5-PS1-4) and one in Engineering Design (3–5-ETS1-3). Together, these PEs focus on the properties of materials, what happens to substances during chemical reactions, and developing and optimizing possible solutions to a design problem involving materials.

Students build on their Grade 2 explorations of the properties of different materials, using measurements to identify mystery substances based on their properties. They investigate solids, liquids, and gases at the particle level.

Students carry out several investigations in which they combine substances and analyze their results to determine changes in properties, if new substances form, and if chemical reactions occur. They learn that, when substances change form or undergo chemical reactions, the total mass (weight) remains unchanged. Students design and test a clay recipe with specific properties based on specific design criteria.

PROGRESSION		
PRIOR KNOWLEDGE		
KINDERGARTEN	GRADE 1	GRADE 2
<p>Module 3 K-PS3-2 K–2-ETS1-3 Be Prepared Students explore different materials, testing how well the different materials shade the ground from the Sun and keep it cool.</p> <p>They create umbrella designs using several different materials, conduct tests, and compare the data to see how well each design and its material (or combination of materials) shades and cools the ground.</p>	<p>Module 3 1-PS4-3 Shadow Town Students predict and test what happens when light is shone through different transparent, translucent, and opaque materials. They explore reflection, using a flashlight and mirror to redirect light at specific objects or locations.</p>	<p>Module 2 2-PS1-1, 2-PS1-2, 2-PS1-3, 2-PS1-4, K–2-ETS1-2, K–2-ETS1-3 Master of Materials Students explore properties of materials, building on their Grade 1 understanding of how well light passes through different materials. They test everyday items to classify materials by property, and discover that a material's properties can change.</p> <p>Students explore the engineering design process. Firstly, designing and testing three tower models, each made of different materials. Secondly, they use the same set of materials to build two different bridges. For each bridge, students focus on a different purpose. They test their designs with weights, and compare the strength of each bridge design.</p>

YELLOWSTONE: UNCOVERED



Performance Expectation Progressions

NGSS Topic Arrangements: Matter and Energy in Organisms and Ecosystems

Yellowstone: Uncovered covers one NGSS Performance Expectation (PE) in the Physical Sciences (5-PS3-1) and two in Life Sciences (5-LS1-1 and 5-LS2-1). Together, these PEs address interdependencies and the flow of energy and matter within ecosystems.

Students revisit concepts about the relationships among plants, animals, and the environment. They grow plants and formalize their understanding of how plants convert matter (from the air and water) and energy (from the Sun) into “food.”

In order to explore how matter and energy flow between the organisms and the environment in an ecosystem, students make field observations and participate in kinesthetic models of food chains/webs. They apply their learning to an “ecosystem model”—a self-contained terrarium that they build. They explore how changes to an ecosystem affect all the organisms within the ecosystem, altering the food web.

PROGRESSION			
PRIOR KNOWLEDGE			FUTURE KNOWLEDGE
KINDERGARTEN	GRADE 2	GRADE 3	GRADE 6
<p>Module 1 K-LS1-1 K-ESS3-1 My Big Nature Adventure Students are introduced to plants and animals. They identify that living organisms need certain things to survive, such as sunlight, food, water, and a place to live. They explore connections between habitats and organisms (e.g., grass grows in a grassland, a jackrabbit eats the grass, a hawk eats the jackrabbit).</p>	<p>Module 4 2-LS2-1 2-LS2-2 A Garden for Life Students further explore ideas from Kindergarten about interdependent relationships in ecosystems. They grow plants in different conditions to confirm that plants need sunlight and water. Students create models to explore connections between flowering plants and the animals that pollinate and gather nectar from the flowers.</p>	<p>Module 3 3-LS4-3 3-LS4-4 How to Survive an Ice Age Students investigate how the ways an organism meets its survival needs make it more or less suited to a particular environment. They use an interactive to explore the effects of changes to an environment on its living organisms.</p>	<p>Module 2 MS-ESS2-4 Destination Everywhere! Students build on ideas from Grade 5 about how matter and energy flow within an ecosystem. They discover the effects of energy from the Sun on the water cycle in an ecosystem and on its climate.</p> <p>Module 3 MS-LS1-5 The Red List Students reinforce the relationship between organisms and the environment, looking at how environmental conditions affect plant growth.</p> <p>Module 4 MS-LS1-5 Cities of the Future Students model watersheds, observing how human-introduced pollutants flow through Earth’s system and affect both living and non-living parts of the system.</p>

H2O RESPONSE TEAM

Performance Expectation Progressions

GRADE 5
MODULE 3

H2O Response Team covers three NGSS Performance Expectations (PEs) in Earth and Space Sciences (5-ESS2-1, 5-ESS2-2, and 5-ESS3-1) and three in Engineering Design (3–5-ETS1-1, 3–5-ETS1-2, 3–5-ETS1-3). Together, these PEs explore interactions among the Earth’s systems—the hydrosphere, geosphere, atmosphere, and biosphere—and examine ways that humans can protect the environment and the Earth’s resources.

Students learn about the sphere interactions that cause clouds to form and rain to fall, as well as those that can prevent rain in certain areas. They investigate and model what causes the ocean to be salty.

Students explore interactions between the Earth’s systems. They research the uneven distribution of fresh water across the globe and model the effects of humans on the hydrosphere. They discover how people can protect limited fresh water and then design and present their own solution to the problem: a water-conservation campaign.

PROGRESSION				
PRIOR KNOWLEDGE				FUTURE KNOWLEDGE
KINDERGARTEN	GRADE 2	GRADE 3	GRADE 4	GRADE 6
<p>Module 4 K-ESS2-2 K-ESS3-3 K–2-ETS1-1 I Can Students are introduced to relationships between humans and natural resources, and discover that people can affect the environment. They learn that humans can act to protect natural resources. Students identify problems around school that can be solved by reusing, recycling, or reducing. They evaluate possible solutions and select one to implement.</p>	<p>Module 1 2-ESS2-2 2-ESS2-3 My Journey West Students explore where water resources and landforms occur. They explore maps to find patterns. They discover that water has liquid and solid forms, flows through the land in rivers, and collects in ponds, lakes, and the ocean.</p> <p>Module 3 2-ESS1-1 2-ESS2-1 K–2-ETS1-1 Save the Island Students build on the Kindergarten idea that plants and animals, including humans, affect the environment. They investigate ways that wind and water shape the land through erosion. Students see that the effects of these interactions can happen quickly or over a very long period. They define design criteria to address the problem of erosion and rising sea levels on Tangier Island, Virginia, and evaluate different engineering solutions.</p>	<p>Module 3 3-LS4-4 How to Survive an Ice Age Students continue to develop the idea from Kindergarten and Grade 2, that people can protect the environment. They explore several examples of the effects of introducing invasive, non-native species into an ecosystem. They then compare and contrast ways humans can try to address this problem.</p> <p>Module 4 3-ESS2-2 Weather Warning HQ Students measure and/or interpret data about a variety of weather conditions (e.g., precipitation, wind speed) to identify seasonal and regional patterns.</p>	<p>Module 3 4-ESS2-1 Time-Traveling Tour Guides Students further explore how different parts of the environment interact. They delve more deeply into erosion and are introduced to weathering. Students observe interactive maps of Earth’s changes over several decades. They create stream trays to observe and measure the effects of water erosion on landforms.</p>	<p>Module 2 MS-ESS2-4 MS-ESS2-5 MS-ESS2-6 Destination Everywhere! Building on their understanding of the hydrosphere from Grade 5, students explore and model evaporation, condensation, transpiration. They discover that energy from the Sun drives the water cycle, affects ocean currents, and moves air masses. They find that complex interactions between Earth’s systems cause weather and climate.</p> <p>Module 4 MS-ESS3-3 MS-ETS1-1 Cities of the Future Students revisit human impacts. They explore ways to track this (e.g., biomonitoring) and consider how data can be used to help develop solutions to protect the Earth’s resources. They develop design criteria for building a new city that minimizes the harmful effects to the environment. They design a solution, assess its viability and calculate its likely environmental impact.</p>

GALACTIC GUIDEBOOK

Performance Expectation Progressions

NGSS Topic Arrangements: Space Systems

GRADE 5
MODULE 4

Galactic Guidebook covers two NGSS Performance Expectations (PEs) in Earth and Space Sciences (5-ESS1-1 and 5-ESS1-2) and one in the Physical Sciences (5-PS2-1). Together, these PEs examine the Sun, Moon, and stars, their relationships with the Earth, and Earth's gravitational force.

Students expand on their Grade 1 investigations by collecting measurements of shadow length and direction, analyzing seasonal sunrise and sunset data to find annual patterns, observing patterns in the stars, and looking for what causes these patterns. They discover that distance from the Earth is

one factor that affects the apparent brightness of the Sun and stars.

Students revisit their understanding of the force of gravity from Grades 3 and 4. They conduct investigations, develop visual models, and craft written explanations to show that the Earth's gravitational force pulls everything to the center of the planet. They use this evidence to construct an argument to explain why people do not fall off the Earth.

PROGRESSION

PRIOR KNOWLEDGE

FUTURE KNOWLEDGE

KINDERGARTEN

GRADE 1

GRADE 3

GRADE 4

GRADE 6

Module 2
K-PS2-1
K-PS2-2
Marble Run Engineer
Students are introduced to forces. They define a force as a push or a pull. They push and pull common objects in the classroom. They find that using a stronger push or pull causes an object to speed up or slow down more quickly.

Module 4
1-ESS1-1
1-ESS1-2
Patterns in the Sky
Students are introduced to the Moon, Sun, and other stars. They record shadows and find a repeating daily pattern of the Sun's position in the sky. They model Earth's rotation and begin to understand why the Sun appears to move. Students explore patterns of the Moon's position and the appearance of stars in the sky. Students also investigate seasonal patterns, interpreting data collected since the beginning of the school year.

Module 1
3-PS2-1
The Ultimate Playground
Students explore balanced and unbalanced forces. They discover that gravity is a force that pushes or pulls objects without being in direct contact. Students design an "Ultimate Playground" with games and rides that use gravity and other forces.

3-D Team Challenge
PS2.A, SEP-3, CCC-2
Catapult Challenge
Student review balanced and unbalanced forces. They construct a catapult, using forces to send a marshmallow as far as possible.

Module 1
4-PS3-1
Egg Racers
Students are introduced to the concept of energy. They investigate simple toys and learn the difference between forces and energy. Exploring movement and collisions with model cars, students consider the forces involved in energy transfers, such as gravity, friction, pushes, and pulls. They design devices and use forces to make their cars move as quickly as possible.

Module 2
MS-ESS2-4
Destination Everywhere!
Students explore how the force of gravity and energy transfers affect the hydrosphere. They create models to show the roles of gravity and energy from the Sun in driving the water cycle.