

MODULES	MODULE PHENOMENON	STORYLINE	PERFORMANCE EXPECTATIONS (*PEs that integrate traditional science content with engineering through SEPs or DCIs)
1: Museum of Leafology NGSS Topic Arrangements: Structure, Function, and Information Processing; Engineering Design 	How are all plants alike and how are they different?	Over the course of the module, students become scientists and curators, creating a Museum of Leafology. Full of different “rooms,” the Museum exhibits fascinating things students learn about plants. Students explore plants through hands-on activities like outdoor nature explorations and growing their own seedlings. They investigate different parts of plants, and design and build an invention inspired by plants to solve school problems. At the module’s close, students invite their friends and family to visit the Museum. Finally, the class prepares a celebratory (and delicious!) salad made of different parts of a plant.	1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.* 1-LS3-1 Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. K-2-ETS1-3 Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.
2: Animal Reporters NGSS Topic Arrangements: Waves; Structure, Function, and Information Processing; Engineering Design 	How do animals use their body parts, communicate with their young, and make sounds?	Students grab their notepads and take on the role of Animal Reporters, embarking on a global quest to observe different animals. On their journey they discover how animals use their body parts and how young animals are similar to and different from their parents. Students learn about sound, finding out how animals communicate with each other. Finally, they are challenged to design and build their own communication devices, discovering how they too can use sounds to communicate over long distances. Over the course of the module, these intrepid Animal Reporters record and present their findings in preparation for their final written articles.	1-LS1-2 Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. 1-LS3-1 Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. 1-PS4-1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. 1-PS4-4 Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.* K-2-ETS1-2 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
3: Shadow Town NGSS Topic Arrangements: Waves 	Why is the town of Rjukan in a shadow?	Let’s go to Shadow Town! The town of Rjukan, in Norway, spends half the year with no direct sunlight. But why? Over the course of the module, students explore light, shadows, and reflection. They create shadow puppets to tell stories of life in Rjukan and experiment with reflective surfaces. Finally, they come up with ideas to solve Rjukan’s problem and compare these with the incredible real-life solution—Rjukan’s residents built giant mirrors to redirect sunlight into their town square.	1-PS4-2 Make observations to construct an evidence-based account that objects can be seen only when illuminated. 1-PS4-3 Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.
4: Patterns in the Sky NGSS Topic Arrangements: Space Systems 	What patterns do we observe in the sky?	The sky is full of amazing patterns, formed by a rich tapestry of celestial objects like the Sun and Moon. Can we use these patterns to make predictions? In this module, students become junior astronomers, using naked-eye observations, creating models, and watching videos to observe and collect data on phenomena that affect us every day. They explore the way the Sun and Moon appear to move across the sky and create posters that document all they have learned.	1-ESS1-1 Use observations of the Sun, Moon, and Stars to describe patterns that can be predicted. 1-ESS1-2 Make observations at different times of year to relate the amount of daylight to the time of year.



CROSS-CURRICULAR CONNECTIONS

Crosscutting Concepts CCC-1 Patterns CCC-2 Cause and Effect CCC-3 Scale, Proportion, and Quantity CCC-4 Systems and System Models CCC-6 Structure and Function CCC-7 Stability and Change Disciplinary Core Ideas LS1.A Structure and Function LS1.B Growth and Development of Organisms LS1.D Information Processing LS3.A Inheritance of Traits LS3.B Variation of Traits Engineering, Technology, and Applications of Science ETS1.A Defining and Delimiting Engineering Problems	Engineering, Technology, and Applications of Science (continued) 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 Math 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 III Natural systems change in ways that people benefit from and can influence	Common Core English Language Arts L.1.4–5 Vocabulary Acquisition and Use RI.1.1–3 Key Ideas and Details RI.1.5–6 Craft and Structure RI.1.7 Integration of Knowledge and Ideas SL.1.1–3 Comprehension and Collaboration SL.1.4–6 Presentation of Knowledge and Ideas W.1.7–8 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 1.MD.A Measure lengths indirectly and by iterating length units 1.MD.C Represent and interpret data MP7 Look for and make use of structure
Crosscutting Concepts CCC-1 Patterns CCC-2 Cause and Effect CCC-3 Scale, Proportion, and Quantity CCC-4 Systems and System Models CCC-6 Structure and Function Disciplinary Core Ideas LS1.A Structure and Function LS1.B Growth and Development of Organisms LS1.D Information Processing LS3.A Inheritance of Traits LS3.B Variation of Traits PS4.A Wave Properties PS4.C Information Technologies and Instrumentation	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-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.1.1–3 Key Ideas and Details RI.1.4–5 Craft and Structure RI.1.7–8 Integration of Knowledge and Ideas SL.1.1–3 Comprehension and Collaboration SL.1.4–5 Presentation of Knowledge and Ideas W.1.2 Text Types and Purposes W.1.5 Production and Distribution of Writing W.1.8 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 1.MD.A Measure lengths indirectly and by iterating length units 1.MD.C Represent and interpret data 1.NBT.A Extend the counting sequence 1.NBT.B Understand place value MP2 Reason abstractly and quantitatively MP5 Use appropriate tools strategically MP7 Look for and make use of structure
Crosscutting Concepts CCC-1 Patterns CCC-2 Cause and Effect Disciplinary Core Ideas PS4.B Electromagnetic Radiation	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	Common Core English Language Arts L.1.5–6 Vocabulary Acquisition and Use RI.1.1–3 Key Ideas and Details RI.1.5 Craft and Structure RI.1.7–9 Integration of Knowledge and Ideas RI.1.1–3 Key Ideas and Details RL.1.4 Craft and Structure RL.1.7 Integration of Knowledge and Ideas SL.1.1–3 Comprehension and Collaboration SL.1.4–6 Presentation of Knowledge and Ideas W.1.3 Text Types and Purposes W.1.7–8 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 1.MD.A Measure lengths indirectly and by iterating length units 1.MD.C Represent and interpret data 1.G.A Reason with shapes and their attributes
Crosscutting Concepts CCC-1 Patterns CCC-2 Cause and Effect CCC-3 Scale, Proportion, and Quantity Disciplinary Core Ideas PS4.B Electromagnetic Radiation ESS1.A The Universe and Its Stars ESS1.B Earth and the Solar System	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 III Natural systems change in ways that people benefit from and can influence	Common Core English Language Arts RF.1.4 Fluency RI.1.1, 3 Key Ideas and Details RI.1.4 Craft and Structure RI.1.7–8 Integration of Knowledge and Ideas RI.1.10 Range of Reading and Level of Text Complexity SL.1.1–3 Comprehension and Collaboration SL.1.4–5 Presentation of Knowledge and Ideas W.1.1–2 Text Types and Purposes W.1.8 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 1.MD.A Measure lengths indirectly and by iterating length units 1.MD.B Tell and write time 1.MD.C Represent and interpret data 1.G.A Reason with shapes and their attributes

Performance Expectation Progressions

NGSS Topic Arrangements: Structure, Function, and Information Processing; Engineering Design

Museum of Leafology covers two NGSS Performance Expectations (PEs) in Life Sciences (1-LS1-1 and 1-LS3-1) and three in Engineering Design (K-2-ETS1-1, K-2-ETS1-2, and K-2-ETS1-3).

Together, these PEs explore the structure and function of plants' external parts and the inheritance and variation of traits in plants. These are investigated further in Grade 1, Module 2, Animal Reporters, with the focus shifting from plants to animals.

PROGRESSION					
PRIOR KNOWLEDGE	CURRENT GRADE	FUTURE KNOWLEDGE			
KINDERGARTEN	GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 6
Module 1 K-LS1-1 My Big Nature Adventure Students are introduced to plants. They care for plants, identifying that plants need sunlight and water to survive. They define living and non-living things.	Module 2 1-LS3-1 Animal Reporters Students continue to explore structure and function, now focusing on animals. They investigate animals' external body parts and chart different way the parts are used. They deepen their understanding of traits, inheritance, and variation by matching and comparing young animals and their parent.	Module 4 2-LS2-2 K-2-ETS1-2 A Garden for Life Students learn more about the structure and function of external plant and animal parts. They explore the relationship between flowers and pollinators. They observe that the shapes, colors, and other features of plant and animal parts help plants and animals that depend on each other. A design challenge builds on students' seed-dispersal modeling in Grade 1. Here, they design and create a pollinator and the plant it pollinates.	Module 2 3-LS3-1 3-LS4-2 Welcome to the Biodome Students revisit trait inheritance. They analyze plant data, explaining patterns of trait heredity and variation. They also begin to explore how trait variation (e.g., coloration) can give individuals a survival advantage. Module 3 3-LS3-2 How to Survive an Ice Age Students discover that environmental conditions can affect traits (e.g., weasels' white winter fur). They differentiate between changed traits that are/are not passed on to offspring.	Module 5 4-LS1-1 Super Survivors Students revisit external plant and animal parts and begin to explore internal structures. They model how external parts and internal organs work together (e.g., breathing, eating/digesting) and explain how these systems help organisms survive.	Module 1 MS-LS1-1 MS-LS1-2 MS-LS1-3 MS-ETS1-1 MS-ETS1-2 Biotech Systems Worldwide Students learn more about systems, focusing on the human body. They enact and model systems to identify system parts and their functions. They explain the function of different animal and plant cell parts. Students are presented with a problem: to design and build a prototype of a prosthetic hand that can pick up a water bottle. They explore the structure of their hands and how its parts function together to pick up objects. They design, build, test, and evaluate their prosthetic hands. Module 3 MS-LS1-5 MS-LS3-2 The Red List Students formalize their understanding of heredity from previous grades by studying genetics. They learn about sexual and asexual reproduction. They explore how genes relate to physical characteristics. They explore how genetic and environmental factors can affect organisms' growth and survival.

ANIMAL REPORTERS

GRADE 1
MODULE 2

Performance Expectation Progressions

NGSS Topic Arrangements: Waves; Structure, Function, and Information Processing; Engineering Design

Animal Reporters covers two NGSS Performance Expectations (PEs) in Life Sciences (1-LS1-2 and 1-LS3-1), two in the Physical Sciences (1-PS4-1 and 1-PS4-4), and three in Engineering Design (K-2-ETS1-1, K-2-ETS1-2, and K-2-ETS1-3).

Students explore the structure and function of animals' external parts, trait inheritance and variation in animals, and animal growth and development. These ideas were investigated in relation to plants in Museum of Leafology. Here, the focus is on animals. Students explore the similarities and differences between the physical characteristics of parents and their offspring. They observe different ways that animals protect, care for, and communicate with their young.

Students investigate sounds made by different animals and identify pitch and volume. They use everyday items, such as rubber bands and glass jars filled with water, to investigate the relationship between sound and vibrations. Based on these investigations, students engineer a communication device. They test, evaluate, and modify designs to ensure that the sound will be heard across a large room or auditorium.

PROGRESSION					
PRIOR KNOWLEDGE	CURRENT GRADE	FUTURE KNOWLEDGE			
KINDERGARTEN	GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 6
Module 1 K-LS1-1 My Big Nature Adventure Students are introduced to animals, identifying that animals have needs, such as food and water, to survive. They define living and non-living things.	Module 1 1-LS3-1 Museum of Leafology Students revisit living and non-living things, as well as the needs of plants. They identify external plant parts and explore ways that shape, size, and other features relate to their roles in meeting a plant's survival. Students grow plants, comparing and contrasting them over time. They compare adult plants and their offspring, discovering that young plants look very like their parents, but that their traits can vary.	Module 4 2-LS2-2 A Garden for Life Students learn more about the structure and function of external plant and animal parts (e.g., structures involved in pollination and nectar gathering). They observe these parts, finding connections between the parts' shapes, colors, and other features of interdependent plants and animals.	Module 2 3-LS1-1 3-LS2-1 3-LS3-1 3-LS4-2 Welcome to the Biodome Students investigate data on external characteristics of animal parents and offspring to explain patterns of trait heredity and variation. They also begin to explore how trait variation (e.g., coloration) can give individuals a survival advantage. They explore life cycles, building on ideas from Kindergarten and Grade 1 that plants and animals grow and have offspring. They begin to learn about group behaviors.	Module 5 4-LS1-1 4-LS1-2 4-PS3-2 4-PS4-3 3-5-ETS1-3 Super Survivors Students revisit external plant and animal parts, and begin to explore internal structures. They model how external parts and internal organs work together to help organisms survive. Students review how sound travels and the concept of loudness. They learn more about how waves are involved in sound, discovering that energy can be transferred by sound and that sounds travel from the source in all directions. They build, test, and revise communication devices to send a message over a long distance.	Module 1 MS-LS1-1 MS-LS1-2 MS-LS1-3 BioTech Systems Worldwide Students learn more about the structure and function of body systems (e.g., muscular, nervous). Focusing on humans, they enact and model systems to identify the parts and their functions. They model cells and their parts, explaining the function of each part. Module 3 MS-LS1-4 MS-LS1-5 MS-LS3-2 The Red List Students formalize their understanding of heredity by studying genetics. They compare asexual and sexual reproduction, and explore how genetic and environmental factors can affect organisms' growth and survival. They learn more about the ways plants and animals ensure successful reproduction.

Performance Expectation Progressions

NGSS Topic Arrangements: Waves

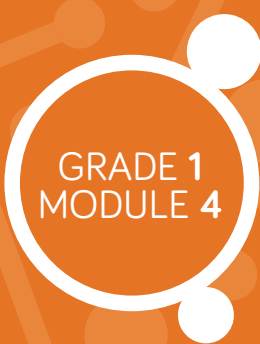
Shadow Town covers two NGSS Performance Expectations (PEs) in the Physical Sciences (1-PS4-2 and 1-PS4-3). Together, these PEs explore shadows, light and dark, and materials.

PROGRESSION			
PRIOR KNOWLEDGE	CURRENT GRADE	FUTURE KNOWLEDGE	
KINDERGARTEN	GRADE 1	GRADE 2	GRADE 5
Module 3 K-PS3-2 Be Prepared Students explore shade. They test model umbrellas in the Sun to see how well different materials shade the ground and keep it cool.	Module 4 1-ESS1-1 Patterns in the Sky Students explore the pattern of the Sun’s apparent motion. They conduct an investigation tracking shadows caused by the Sun and a stationary object. They identify the Sun as a star and stars as light sources. They conduct experiments to identify the Moon as a reflector.	Module 2 2-PS1-1 2-PS1-2 Master of Materials Students describe observable material properties, such as color and texture. They test and classify materials by property (e.g., strength, absorbency). By building towers of different materials, they connect a material’s properties to its suitability for a specific purpose.	Module 1 5-PS1-3 Matter Mysteries Hotline Students move from observing to measuring properties of materials. They test mystery materials and, based on the tests, select the best materials for a project. They explore how materials’ properties can change, learning about states of matter. Module 4 5-ESS1-2 Galactic Guidebook Students conduct a more detailed sun shadow investigation. In addition to tracking shadow position, they measure the length and direction of shadows. They graph and interpret their data to find daily patterns.

PATTERNS IN THE SKY

Performance Expectation Progressions

NGSS Topic Arrangements: Space Systems



Patterns in the Sky covers two NGSS Performance Expectations (PEs) in Earth and Space Sciences (1-ESS1-1 and 1-ESS1-2) and one in the Physical Sciences (1-PS4-3). Together, these PEs introduce the Sun, Moon, and stars, and investigate patterns of their movement.

Students record shadows at different times of day and analyze this data, finding a repeating daily pattern of the Sun’s position in the sky.

They model the 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, and also investigate seasonal patterns. Interpreting data collected since the beginning of the school year, they write about seasonal changes in the amount of daylight.

PROGRESSION
FUTURE KNOWLEDGE
GRADE 5
Module 4 5-ESS1-1 5-ESS1-2 Galactic Guidebook Students revisit relationships between the Earth and the Sun, Moon, and stars. They expand on the Sun shadow investigation from Grade 1, collecting data not only on shadow position but also measurements of shadow length and direction. From seasonal sunrise/sunset data for a given year, students create bar graphs, find annual patterns, and identify the shortest and longest days. They deepen their ideas about how the Earth’s rotation relates to observable patterns in the sky. They explore constellations visible throughout the year. They model the relative size and distance of stars from the Earth, discovering factors that affect the apparent brightness of the Sun and stars.