Pre-K to Grade 6

NGSS Alignment and Progressions







twig Science

NEXT GEN

twig Science

Pre-K to Grade 6 NGSS ALIGNMENT AND PROGRESSIONS

NGSS Framework Alignment	**3**
Pre-Kindergarten Scope and Sequence	**4**
Performance Expectation Progressions	5
Kindergarten Scope and Sequence	**6**
Module 1 Performance Expectation Progressions	8
Module 2 Performance Expectation Progressions	9
Module 3 Performance Expectation Progressions	10
Module 4 Performance Expectation Progressions	11
Grade 1 Scope and Sequence	**12**
Module 1 Performance Expectation Progressions	14
Module 2 Performance Expectation Progressions	15
Module 3 Performance Expectation Progressions	16
Module 4 Performance Expectation Progressions	17
Grade 2 Scope and Sequence	**18**
Module 1 Performance Expectation Progressions	20
Module 2 Performance Expectation Progressions	21
Module 3 Performance Expectation Progressions	22
Module 4 Performance Expectation Progressions	23
Grade 3 Scope and Sequence	**24**
Module 1 Performance Expectation Progressions	26
Module 2 Performance Expectation Progressions	27
Module 3 Performance Expectation Progressions	28
Module 4 Performance Expectation Progressions	29
Grade 4 Scope and Sequence	**30**
Module 1 Performance Expectation Progressions	32
Module 2 Performance Expectation Progressions	33
Module 3 Performance Expectation Progressions	34
Module 4 Performance Expectation Progressions	35
Module 5 Performance Expectation Progressions	36
Grade 5 Scope and Sequence	**38**
Module 1 Performance Expectation Progressions	40
Module 2 Performance Expectation Progressions	41
Module 3 Performance Expectation Progressions	42
Module 4 Performance Expectation Progressions	43
Grade 6 Scope and Sequence	**44**
Module 1 Performance Expectation Progressions	46
Module 2 Performance Expectation Progressions	47
Module 3 Performance Expectation Progressions	48
Module 4 Performance Expectation Progressions	49



Additional resources available at:

twig Science | TOOLS
www.twigsciencetools.com

twig Science | REPORTER
www.twigsciencereporter.com

twig Science | NEXT GEN

NGSS Framework Alignment

GRADE	NGSS TOPIC ARRANGEMENTS	MODULE	MODULE PHENOMENON	CORE PERFORMANCE EXPECTATIONS
GRADE K 	Interdependent Relationships in Ecosystems	My Big Nature Adventure	Different plants and animals live in different places.	K-LS1-1, K-ESS3-1
	Forces and Interactions; Engineering Design	Marble Run Engineer	What happens when we push, pull, and drop objects? How can we change their speed and direction?	K-PS2-1, K-PS2-2, K–2-ETS1-1
	Weather and Climate; Engineering Design	Be Prepared	How do we observe weather and collect data to describe weather patterns over time?	K-ESS2-1, K-ESS3-2, K-PS3-1, K-PS3-2, K–2-ETS1-1, K–2-ETS1-2, K–2-ETS1-3
	Interdependent Relationships in Ecosystems	I Can	How can I protect the environment from changes that harm it?	K-ESS2-2, K-ESS3-3, K–2-ETS1-1
GRADE 1 	Structure, Function, and Information Processing; Engineering Design	Museum of Leafology	How are all plants alike and how are they different?	1-LS1-1, 1-LS3-1, K–2-ETS1-1, K–2-ETS1-2, K–2-ETS1-3
	Waves; Structure, Function, and Information Processing; Engineering Design	Animal Reporters	How do animals use their body parts, communicate with their young, and make sounds?	1-LS1-2, 1-LS3-1, 1-PS4-1, 1-PS4-4, K–2-ETS1-1, K–2-ETS1-2
	Waves	Shadow Town	Why is the town of Rjukan in a shadow?	1-PS4-2, 1-PS4-3
	Space Systems	Patterns in the Sky	What patterns do we observe in the sky?	1-ESS1-1, 1-ESS1-2
GRADE 2 	Earth's Systems	My Journey West	How can we understand and describe the land and water on Earth?	2-ESS2-2, 2-ESS2-3
	Structure and Properties of Matter; Engineering Design	Master of Materials	How can we describe materials as different from one another and understand how their properties relate to their use?	2-PS1-1, 2-PS1-2, 2-PS1-3, 2-PS1-4, K–2-ETS1-2, K–2-ETS1-3
	Earth's Systems; Engineering Design	Save the Island	How do natural processes shape the Earth?	2-ESS1-1, 2-ESS2-1, K–2-ETS1-1, K–2-ETS1-2
	Interdependent Relationships in Ecosystems; Engineering Design	A Garden for Life	How do living things in an environment depend on one another and what do they need to grow?	2-LS2-1, 2-LS2-2, 2-LS4-1, K–2-ETS1-1, K–2-ETS1-2
GRADE 3 	Forces and Interactions; Engineering Design	The Ultimate Playground	How are objects affected by the forces of push and pull?	3-PS2-1, 3-PS2-2, 3-PS2-3, 3-PS2-4, 3–5-ETS1-1, 3–5-ETS1-2, 3–5-ETS1-3
	Inheritance and Variation of Traits	Welcome to the Biodome	How do plants' and animals' life cycles help them survive?	3-LS1-1, 3-LS2-1, 3-LS3-1, 3-LS4-2
	Interdependent Relationships in Ecosystems	How to Survive an Ice Age	What is the relationship between an organism and its environment?	3-LS3-2, 3-LS4-1, 3-LS4-3, 3-LS4-4
	Weather and Climate	Weather Warning HQ	What is the weather like around the world?	3-ESS2-1, 3-ESS2-2, 3-ESS3-1, 3–5-ETS1-1, 3–5-ETS1-2
GRADE 4 	Energy; Engineering Design	Egg Racers	What happens to energy when objects collide?	4-PS3-1, 4-PS3-3, 3–5-ETS1-3
	Energy; Engineering Design	Sparks Energy, Inc.	How do people produce and transfer energy for their use?	4-ESS3-1, 4-PS3-2, 4-PS3-4, 3–5-ETS1-1, 3–5-ETS1-2
	Earth's Systems	Time-Traveling Tour Guides	How have weathering and erosion sculpted some of Earth's most interesting landscapes?	4-ESS1-1, 4-ESS2-1, 4-ESS2-2, 4-ESS3-2, 3-5-ETS1-2
	Earth's Systems; Engineering Design	Earthquake Engineering	How can we reduce the damage caused by earthquakes?	4-PS4-1, 4-ESS2-2, 4-ESS3-2, 3–5-ETS1-1, 3–5-ETS1-2, 3–5-ETS1-3
	Waves; Structure, Function, and Information Processing	Super Survivors	How do the many parts of my body work together to help me live in the world? Communication involves transferring information through waves or signals.	4-LS1-1, 4-LS1-2, 4-PS3-2, 4-PS4-1, 4-PS4-2, 4-PS4-3, 3–5-ETS1-3
GRADE 5 	Structure and Properties of Matter; Engineering Design	Matter Mysteries Hotline	What is matter made of?	5-PS1-1, 5-PS1-2, 5-PS1-3, 5-PS1-4, 3–5-ETS1-3
	Matter and Energy in Organisms and Ecosystems	Yellowstone: Uncovered	How do matter and energy move through an ecosystem?	5-LS1-1, 5-LS2-1, 5-PS3-1
	Earth's Systems; Engineering Design	H2O Response Team	Why do some places lack fresh water and what can we do to protect it?	5-ESS2-1, 5-ESS2-2, 5-ESS3-1, 3–5-ETS1-1, 3–5-ETS1-2, 3–5-ETS1-3
	Space Systems	Galactic Guidebook	What patterns do we notice when we observe the sky?	5-PS2-1, 5-ESS1-1, 5-ESS1-2
GRADE 6 	Structure, Function, and Information Processing; Engineering Design	BioTech Systems Worldwide	How do human body systems and subsystems work together?	MS-LS1-1, MS-LS1-2, MS-LS1-3, MS-LS1-8, MS-ETS1-1, MS-ETS1-2
	Weather and Climate; Energy; Engineering Design	Destination Everywhere!	Weather and climate vary around the world, but we can use science and past trends to predict them.	MS-ESS2-4, MS-ESS2-5, MS-ESS2-6, MS-PS3-3, MS-PS3-4, MS-PS3-5, MS-ETS1-1, MS-ETS1-3
	Growth, Development, and Reproduction of Organisms	The Red List	How do the environment and genetics affect animals and plants?	MS-LS1-4, MS-LS1-5, MS-LS3-2, MS-ETS1-1, MS-ETS1-2
	Weather and Climate; Human Impacts; Engineering Design	Cities of the Future	How can we reduce harmful impacts on the environment in the places where people live?	MS-ESS3-3, MS-ESS3-5, MS-LS1-4, MS-LS1-5, MS-ETS1-1, MS-ETS1-2, MS-ETS1-3, MS-ETS1-4

twig Science Pre-K Scope and Sequence

MODULE	NGSS	HEAD START PERFORMANCE STANDARDS			
1. Senses Safari Students journey through the jungle, using their five senses to explore the world around them.	**K-LS1-1, SEP-6, CCC-4, CCC-6**	**Approaches to Learning** **Lesson 1, 3, 9** P-ATL 2 **Lesson 1, 7** P-ATL 3 **Lesson 1, 2, 3, 4, 7, 9** P-ATL 4 **Lesson 2, 4, 6, 7** P-ATL 8 **Lesson 3, 6** P-ATL 9; P-ATL 12 **Lesson 1,** P-ATL 11 **Lesson 3, 9** P-ATL 13	**Language and Communication** **Lesson 1–9** P-LC 1 **Lesson 3, 5, 7** P-LC 2 **Lesson 1, 3** P-LC 3 **Lesson 3** P-LC 5 **Lesson 1, 3, 9** P-LC 6 **Lesson 3, 5, 7** P-LC 7 **Literacy** **Lesson 3, 5, 7, 8** P-LIT 3 **Lesson 3, 5** P-LIT 4; P-LIT 5; P-LIT 6	**Social and Emotional Development** **Lesson 1** P-SE 3 **Lesson 4, 7** P-SE 4 **Lesson 4** P-SE 7 **Mathematics Development** **Lesson 4, 5, 7** P-MATH 1 **Lesson 1, 7** P-MATH 2; P-MATH 3 **Lesson 7** P-MATH 9 **Lesson 4, 7** P-MATH 10	**Scientific Reasoning** **Lesson 1–6, 8** P-SCI 1 **Lesson 4, 5** P-SCI 2 **Lesson 1, 4, 5** P-SCI 3 **Lesson 3** P-SCI 4 **Lesson 1, 4** P-SCI 5 **Lesson 1, 4, 6** P-SCI 6 **Motor and Physical Development** **Lesson 2, 4** P-PMP 1 **Lesson 1, 2, 4, 6, 8** P-PMP 2 **Lesson 1, 4, 5, 7** P-PMP 3
2. How to Build a Human What are the ingredients that make up a human being? In this module, students learn about their different body parts and how they work together—before building a human of their own!	**K-LS1-1, SEP-2, CCC-4 , CCC-6**	**Approaches to Learning** **Lesson 2, 6, 7, 8** P-ATL 3 **Lesson 1, 4, 5, 8** P-ATL 4 **Lesson 1, 4, 6, 8** P-ATL 8 **Lesson 1, 2, 4, 5, 8** P-ATL 9 **Lesson 3** P-ATL 11 **Lesson 4, 6** P-ATL 13 **Literacy** **Lesson 3** P-LIT; P-LIT 5; P-LIT 6	**Language and Communication** **Lesson 1–10** P-LC 1 **Lesson 1, 3, 4, 8, 10** P-LC 2 **Lesson 8** P-LC 4 **Lesson 1, 9** P-LC 6 **Lesson 3** P-LC 7	**Mathematics Development** **Lesson 8** P-MATH 2; P-MATH 3; P-MATH 9 **Lesson 1, 8** P-MATH 10 **Scientific Reasoning** **Lesson 2, 4, 5, 7, 9** P-SCI 1 **Lesson 2w, 3, 4, 6, 9** P-SCI 2 **Lesson 7** P-SCI 3 **Lesson 2, 7, 9** P-SCI 4	**Motor and Physical Development** **Lesson 1, 4, 6, 9** P-PMP 1 **Lesson 1, 4, 5, 8, 9** P-PMP 2 **Lesson 1, 5, 7, 8, 10** P-PMP 3 **Lesson 3** P-PMP 5 **Social and Emotional Development** **Lesson 4, 8, 10** P-SE 3 **Lesson 9, 10** P-SE 4
3. Ultimate Games Day How do we use forces to play games? Students design the Ultimate Games Day using their knowledge of pushes and pulls.	**K-PS2-1, SEP-3, SEP-6, SEP-8, CCC-2**	**Approaches to Learning** **Lesson 2, 4, 8, 9** P-ATL 3 **Lesson 4, 8** P-ATL 4 **Lesson 2, 4, 5, 7, 8, 9** P-ATL 8 **Lesson 2, 9** P-ATL 9 **Lesson 2–5** P-ATL 10 **Lesson 1–3** P-ATL 11 **Lesson 4, 5, 9** P-ATL 12 **Lesson 1, 9** P-ATL 13	**Language and Communication** **Lesson 1–9** P-LC 1 **Lesson 1, 4** P-LC 2 **Lesson 9** P-LC 3 **Lesson 4** P-LC 4 **Lesson 1, 2, 9** P-LC 5 **Lesson 1, 2, 4** P-LC 6 **Lesson 1**P-LC 7 **Motor and Physical Development** **Lesson 1, 2, 4, 6, 8, 9** P-PMP 1; P-PMP 3 **Lesson 1–4, 6, 8, 9** P-PMP 2	**Social and Emotional Development** **Lesson 4, 9** P-SE 3 **Lesson 2, 4, 6, 8, 9** P-SE 4 **Lesson 7, 8** P-SE 11 **Literacy** **Lesson 1–5, 7** P-LIT 3 **Lesson 1** P-LIT 4 **Lesson 1** P-LIT 5 **Lesson 1, 3** P-LIT 6	**Mathematics Development** **Lesson 1–9** P-MATH 1 **Lesson 4** P-MATH 4 **Lesson 3, 4** P-MATH 10 **Scientific Reasoning** **Lesson 1–5, 9** P-SCI 1 **Lesson 3, 9** P-SCI 2 **Lesson 2–6** P-SCI 3 **Lesson 2, 4, 6** P-SCI 4; P-SCI 6 **Lesson 4** P-SCI 5
4. Weather Explorers Recording weather in the Arctic and at home, students examine patterns in data and investigate how weather and the seasons affect humans and animals.	**K-ESS2-1, SEP-3, CCC-1, CCC-2**	**Approaches to Learning** **Lesson 1, 5** P-ATL 2 **Lesson 1, 2, 4, 5** P-ATL 3 **Lesson 2, 8** P-ATL 4 **Lesson 1, 2, 5, 7–9** P-ATL 8 **Lesson 1, 2, 5, 7, 9 Lesson** P-ATL 9 **Lesson 1, 3–8** P-ATL 11 **Lesson 1, 2, 6, 9** P-ATL 12 **Lesson 6, 9** P-ATL 13	**Language and Communication** **Lesson 1–9 P-LC 1** **Lesson 1, 3, 7** P-LC 2 **Lesson 7, 9** P-LC 3 **Lesson 1, 6–9** P-LC 5 **Lesson 1, 3, 7** P-LC 6 **Lesson 3, 4, 6–9** P-LC 7 **Literacy** **Lesson 1, 3, 6, 8** P-LIT 3 **Lesson 3, 8** P-LIT 5; P-LIT 6	**Social and Emotional Development** **Lesson 1, 2, 5** P-SE 3 **Lesson 1** P-SE 4; P-SE 7 **Scientific Reasoning** **Lesson 1–6, 8, 9** P-SCI 1 **Lesson 4, 5** P-SCI 2; P-SCI 5 **Lesson 1–9** P-SCI 3 **Lesson 2–9** P-SCI 4 **Lesson 5, 6, 9** P-SCI 6	**Mathematics Development** **Lesson 2–9** P-MATH 1 **Lesson 9** P-MATH 2; P-MATH 3; P-MATH 4; P-MATH 10 **Motor and Physical Development** **Lesson 1, 5** P-PMP 1 **Lesson 1, 4, 5** P-PMP 2 **Lesson 1–9** P-PMP 3 **Lesson 1** P-PMP 6
5. Shipwreck Island Students find themselves washed up on a tropical island! They'll need to work together to complete a number of design and engineering tasks before they can make their escape.	**K-2-ETS1-2, K-2-ETS1-3, SEP-1, SEP-3, SEP-4, CCC-1**	**Approaches to Learning** **Lesson 1** P-ATL 2 **Lesson 1–6, 8–10** P-ATL 3 **Lesson 1, 2, 4–6, 8–10** P-ATL 4; P-ATL 8; P-ATL 9 **Lesson 9** P-ATL 7; P-ATL 10 **Lesson 2, 7** P-ATL 11 **Lesson 1, 2, 9** P-ATL 12 **Lesson 4, 6, 8, 9** P-ATL 13	**Language and Communication** **Lesson 1–10** P-LC 1 **Lesson 4, 7–9** P-LC 2 **Lesson 9** P-LC 3 **Lesson 1–4, 7–10** P-LC 5 **Lesson 1, 5, 7–10** P-LC 6 **Lesson 1–3, 6, 7, 9, 10** P-LC 7 **Motor and Physical Development** **Lesson 1, 5, 6, 8, 10** P-PMP 1 **Lesson 1, 2, 4–6, 8–10** P-PMP 2; P-PMP 3 **Lesson 3** P-PMP 4; P-PMP 6	**Social and Emotional Development** **Lesson 2–10** P-SE 3 **Lesson 4–6, 9, 10** P-SE 4 **Scientific Reasoning** **Lesson 1–8, 10** P-SCI 1 **Lesson 4–6, 8, 10** P-SCI 2 **Lesson 1, 2, 4–6, 8, 10** P-SCI 3 **Lesson 1, 4–8, 10** P-SCI 4 **Lesson 4–6, 8, 10** P-SCI 5 **Lesson 1, 4–6, 8, 10** P-SCI 6	**Mathematics Development** **Lesson 5, 6** P-MATH 1 **Lesson 6** P-MATH 2; P-MATH 3; P-MATH 4; P-MATH 5 **Lesson 9** P-MATH 9 **Lesson 1, 4, 6, 8, 10** P-MATH 10 **Literacy** **Lesson 2, 3, 5–7, 10** P-LIT 3 **Lesson 3, 7** P-LIT 4 **Lesson 3, 7** P-LIT 5 **Lesson 2, 3, 5, 7** P-LIT 6
6. Life on a Farm Students explore what lives on a farm and investigate how we can grow plants to provide us with food. As new animals are born on the farm, students learn about the different stages of life cycles.	**K-LS1-1, K-ESS3-1, SEP-2, SEP-8, CCC-1, CCC-4**	**Approaches to Learning** **Lesson 3–7, 9** P-ATL 2 **Lesson 3–7** P-ATL 3 **Lesson 1–5, 7, 9** P-ATL 4 **Lesson 1** P-ATL 7 **Lesson 5, 7** P-ATL 8 **Lesson 5** P-ATL 9 **Lesson 1–4, 6** P-ATL 11 **Lesson 1, 4, 5, 7** P-ATL 12 **Lesson 1, 5, 7–9** P-ATL 13	**Language and Communication** **Lesson 1–9** P-LC 1 **Lesson 2, 4–6** P-LC 2 **Lesson 1, 4, 5, 8** P-LC 3 **Lesson 3, 6, 7** P-LC 5 **Lesson 2, 4, 6** P-LC 6 **Lesson 2, 4, 9** P-LC 7 **Social and Emotional Development** **Lesson 1, 7** P-SE 3 **Lesson 5, 7, 9** P-SE 4 **Lesson 3–7** P-SE 7	**Literacy** **Lesson 2, 4, 6, 9** P-LIT 3 **Lesson 2, 6** P-LIT 5 **Lesson 2, 4, 6** P-LIT 6 **Motor and Physical Development** **Lesson 1, 5, 7–9** P-PMP 1 **Lesson 3–9** P-PMP 2 **Lesson 2–4, 8,9** P-PMP 3 **Lesson 8** P-PMP 5 **Lesson 4, 7** P-PMP 6	**Mathematics Development** **Lesson 3–8** P-MATH 9 **Scientific Reasoning** **Lesson 1– 8** P-SCI 1 **Lesson 2, 6, 8** P-SCI 2 **Lesson 1, 2, 4–8** P-SCI 3 **Lesson 1, 3, 6** P-SCI 4 **Lesson 3–8** P-SCI 5 **Lesson 8** P-SCI 6
7. Ocean Deep How do humans impact the environment in our oceans? Students dive under the water and investigate the ecosystems that are affected by human behavior.	**K-ESS3-3, SEP-2, SEP-3, CCC-2**	**Approaches to Learning** **Lesson 7, 9** P-ATL 2 **Lesson 1, 2, 5, 7–9** P-ATL 3 **Lesson 5, 7–9** P-ATL 4 **Lesson 2, 7** P-ATL 7 **Lesson 2, 7–9** P-ATL 8 **Lesson 1, 4, 7, 9** P-ATL 9 **Lesson 7, 9** P-ATL 10 **Lesson 1–9** P-ATL 11 **Lesson 2, 6, 7, 9** P-ATL 12 **Lesson 2, 4, 9** P-ATL 13	**Language and Communication** **Lesson 1–9** P-LC 1 **Lesson 1, 3, 5, 6, 8** P-LC 2 **Lesson 2, 4, 8, 9** P-LC 3 **Lesson 3, 4, 6, 7, 9** P-LC 5 **Lesson 3, 5, 6, 9** P-LC 6 **Lesson 1, 3, 5, 6** P-LC 7 **Literacy** **Lesson 1, 3–6** P-LIT 3 **Lesson 3, 6** P-LIT 5 **Lesson 3, 6, 9** P-LIT 6	**Social and Emotional Development** **Lesson 1, 2, 4, 5, 7–9** P-SE 3; P-SE 4 **Lesson 4, 5, 9** P-SE 7 **Lesson 8, 9** P-SE 11 **Motor and Physical Development** **Lesson 1, 3, 4** P-PMP 1 **Lesson 1, 4, 5, 7–9** P-PMP 2 **Lesson 1, 2, 5, 7–9** P-PMP 3 **Lesson 8** P-PMP 6	**Scientific Reasoning** **Lesson 1–7, 9** P-SCI 1 **Lesson 2, 3 9** P-SCI 2 **Lesson 1–6, 9** P-SCI 3 **Lesson 1, 5–7** P-SCI 4 **Lesson 4, 5, 7** P-SCI 5 **Lesson 1, 4, 5, 7** P-SCI 6 **Mathematics Development** **Lesson 1** P-MATH 1; P-MATH 2; P-MATH 3; P-MATH 4; P-MATH 10
8. Space Race Students explore what they can see in the sky at nighttime and during the day before blasting off into space for an intergalactic adventure.	**SEP-2, SEP-6, CCC-3, CCC-4**	**Approaches to Learning** **Lesson 2, 3** P-ATL 2 **Lesson 1, 3–6** P-ATL 3 **Lesson 1, 5** P-ATL 4 **Lesson 3** P-ATL 7 **Lesson 3–5, 7** P-ATL 8 **Lesson 3–5** P-ATL 9 **Lesson 4, 7** P-ATL 10 **Lesson 1, 3–5** P-ATL 11 **Lesson 4, 5, 7** P-ATL 12 **Lesson 3–5** P-ATL 13	**Language and Communication** **Lesson 1–7** P-LC 1 **Lesson 1, 2, 4, 6, 7** P-LC 2 **Lesson 1, 4, 7** P-LC 3 **Lesson 2** P-LC 4 **Lesson 5, 7** P-LC 5 **Lesson 2, 4, 5** P-LC 6 **Lesson 2, 5, 6** P-LC 7 **Social and Emotional Development** **Lesson 4, 5, 7** P-SE 3 **Lesson 4, 5** P-SE 4	**Literacy** **Lesson 2, 5, 6** P-LIT 3 **Lesson 2, 6** P-LIT 5 **Lesson 2, 3, 6, 7** P-LIT 6 **Mathematics Development** **Lesson 4** P-MATH 1; P-MATH 2 **Lesson 2** P-MATH 4; P-MATH 8 **Lesson 1, 4** P-MATH 9 **Lesson 1, 3, 4, 7** P-MATH 10	**Scientific Reasoning** **Lesson 1–7** P-SCI 1 **Lesson 2–4** P-SCI 2 **Lesson 1, 2, 6** P-SCI 3 **Lesson 1, 3, 5** P-SCI 4 **Lesson 3, 5** P-SCI 5 **Motor and Physical Development** **Lesson 2, 3, 5** P-PMP 1 **Lesson 1, 3–5** P-PMP 2 **Lesson 1, 3–5, 7** P-PMP 3 **Lesson 1, 3** P-PMP 6

PRE-KINDERGARTEN

Performance Expectation Progressions

Pre-Kindergarten lays the foundations for the science skills that students use as they progress through Twig Science.
Pre-K modules connect Head Start Performance Standards to NGSS Performance Expectations, which are revisited in future grades.



PROGRESSION

CURRENT GRADE	FUTURE KNOWLEDGE NGSS PERFORMANCE EXPECTATIONS						
PRE-KINDERGARTEN	KINDERGARTEN	GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 5	GRADE 6
Senses Safari	Module 1 My Big Nature Adventure K-LS1-1	Module 1 Museum of Leafology 1-LS1-1	—	—	Module 5 Super Survivors 4-LS1-1 4-LS1-2	—	Module 1 BioTech Systems Worldwide MS-LS1-8
How to Build a Human	Module 1 My Big Nature Adventure K-LS1-1	Module 1 Museum of Leafology 1-LS1-1	—	—	Module 5 Super Survivors 4-LS1-1	—	Module 1 BioTech Systems Worldwide MS-LS1-3
Ultimate Games Day	Module 2 Marble Run Engineer K-PS2-1	—	—	Module 1 The Ultimate Playground 3-PS2-1 3-PS2-2	—	Module 4 Galactic Guidebook 5-PS2-1	—
Weather Explorers	Module 3 Be Prepared K-ESS2	—	—	Module 4 Weather Warning HQ 3-ESS2-1	—	Module 4 Galactic Guidebook 5-ESS1-2	Module 2 Destination Everywhere! MS-ESS2-5
Shipwreck Island	Module 3 Be Prepared K-PS3-2 K–2-ETS1-3	Module 3 Shadow Town 1-PS4-3	Module 2 Master of Materials 2-PS1-1 2-PS1-2	—	—	Module 1 Matter Mysteries Hotline 5-PS1-3	—
Life on a Farm	—	Module 2 Animal Reporters 1-LS3-1	—	Module 2 Welcome to the Biodome 3-LS1-1	Module 5 Super Survivors 4-LS1-1	Module 2 Yellowstone: Uncovered 5-LS1-1	Module 3 The Red List MS-LS1-4
Ocean Deep	Module 4 I Can K-ESS3-3	—	Module 3 Save the Island Module 4 A Garden for Life K–2-ETS1-1	Module 3 How to Survive an Ice Age 3-LS4-4	Module 2 Sparks Energy, Inc. 4-ESS3-1	Module 3 H2O Response Team 5-ESS3-1 5-ESS2-2	Module 4 Cities of the Future MS-ESS3-3
Space Adventure	—	Module 4 Patterns in the Sky 1-ESS1-1	—	—	—	Module 4 Galactic Guidebook 5-ESS1-1	—

twig Science

twig Science | NEXT GEN Grade K Scope and Sequence

MODULES	MODULE PHENOMENON	STORYLINE	PERFORMANCE EXPECTATIONS (*PEs that integrate traditional science content with engineering through SEPs or DCIs)
1: My Big Nature Adventure **NGSS Topic Arrangements: Interdependent Relationships in Ecosystems** 	Different plants and animals live in different places.	Hold on tight—you're going on an adventure! In this module, students travel the world looking at different environments—including deserts, grasslands, cities, and even their very own schoolyard. They observe some of the plants and animals that live in these places, and discover that each environment provides living things with everything they need to survive. Through hands-on exploration, videos, and books, students also learn that all living things share the same basic needs—whether you're a plant, a human, or a dung beetle!	**K-LS1-1** Use observations to describe patterns of what plants and animals (including humans) need to survive. **K-ESS3-1** Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places in which they live.
2: Marble Run Engineer **NGSS Topic Arrangements: Forces and Interactions; Engineering Design** 	What happens when we push, pull, and drop objects? How can we change their speed and direction?	In this module, students become Marble Run Engineers. They explore forces by observing and analyzing what happens when they push and pull different objects. They use tools to alter and measure how far they can push a marble, and how precisely they can control its direction. Finally, students put all their knowledge into practice by designing, building, observing, and analyzing fun (and functional!) marble run tracks. Let's roll!	**K-PS2-1** Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. **K-PS2-2** Analyze data to determine whether a design solution works as intended to change the speed or direction of an object with a push or a pull.* **K–2-ETS1-1** Ask questions, make observations, and gather information about a situation people want to change in order to define a simple problem that can be solved through the development of a new or improved object or tool.
3: Be Prepared **NGSS Topic Arrangements: Weather and Climate; Engineering Design** 	How do we observe weather and collect data to describe weather patterns over time?	What's the weather like? In this module, students find out by becoming amateur meteorologists! They observe weather patterns, learn to interpret weather forecasts, and use their knowledge to prepare for whatever the weather throws at them. Students explore the importance of staying protected from the Sun, build their own mini-umbrellas, and find out how meteorologists make and share their predictions about the weather. Finally, they create weather forecasts of their own—because whatever the weather, it pays to be prepared!	**K-ESS2-1** Use and share observations of local weather conditions to describe patterns over time. **K-ESS3-2** Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.* **K-PS3-1** Make observations to determine the effect of sunlight on the Earth's surface. **K-PS3-2** Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.* **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.
4: I Can **NGSS Topic Arrangements: Interdependent Relationships in Ecosystems** 	How can I protect the environment from changes that harm it?	Animals can, plants can—and I can! In this module, students discover how living things can change their environments to meet their basic needs. Using videos and texts, students explore examples, such as earthworms, beavers, and trees, and consider the positive and negative impacts of the changes they make. Students consider how humans can change the environment too—how we can harm it, and how we can protect it. Finally, students identify one way they can help to protect the natural world, and invite other students to do the same.	**K-ESS2-2** Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. **K-ESS3-3** Communicate solutions that will reduce the impact of humans on land, water, air, and/or other living things in the local environment.* **K–2-ETS1-1** Ask questions, make observations, and gather information about a situation people want to change in order to define a simple problem that can be solved through the development of a new or improved object or tool.

ASSESSMENT All modules include: Pre-Exploration, Formative Assessment, Performance Task, and Multiple Choice Assessment

NGSS

CROSS-CURRICULAR CONNECTIONS

Crosscutting Concepts
CCC-1 Patterns
CCC-2 Cause and Effect
CCC-4 Systems and System Models
CCC-7 Stability and Change

Disciplinary Core Ideas
LS1.C Organization for Matter and Energy Flow in Organisms
ESS3.A Natural Resources

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-7 Engaging in Argument from Evidence
SEP-8 Obtaining, Evaluating, and Communicating Information

Environmental Principles and Concepts
Principle I People depend on natural systems
Principle II People influence natural systems

Common Core English Language Arts
RI.K.1–3 Key Ideas and Details
RI.K.4–6 Craft and Structure
RI.K.7–8 Integration of Knowledge and Ideas
RI.K.10 Range of Reading and Level of Text Complexity
L.K.5–6 Vocabulary Acquisition and Use
RF.K.1 Print Concepts
RF.K.3 Phonics and Word Recognition
RF.K.4 Fluency
SL.K.1–3 Comprehension and Collaboration
SL.K.4, 6 Presentation of Knowledge and Ideas
W.K.2 Text Types and Purposes
W.K.7–8 Research to Build and Present Knowledge

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
K.G.A Identify and describe shapes
K.MD.A Describe and compare measurable attributes
K.MD.B Classify objects and count the number of objects in each category
MP5 Use appropriate tools strategically
MP6 Attend to precision
MP7 Look for and make use of structure

Crosscutting Concepts
CCC-1 Patterns
CCC-2 Cause and Effect

Disciplinary Core Ideas
PS2.A Forces and Motion
PS2.B Types of Interactions
PS3.C Relationship Between Energy and Forces

Engineering, Technology, and Applications of Science
ETS1.A Defining and Delimiting an Engineering Problem

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-7 Engaging in Argument from Evidence
SEP-8 Obtaining, Evaluating, and Communicating Information

Common Core English Language Arts
RI.K.1–3 Key Ideas and Details
RI.K.7–8 Integration of Knowledge and Ideas
RI.K.10 Range of Reading and Level of Text Complexity
L.K.6 Vocabulary Acquisition and Use
RF.K.1 Print Concepts
RF.K.3 Phonics and Word Recognition
RF.K.4 Fluency
SL.K.1–3 Comprehension and Collaboration
SL.K.4–6 Presentation of Knowledge and Ideas
W.K.2–3 Text Types and Purposes
W.K.5 Production and Distribution of Writing
W.K.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
K.CC.A Know number names and the count sequence
K.CC.B Count to tell the number of objects
K.MD.A Describe and compare measurable attributes
K.MD.B Classify objects and count the number of objects in each category
K.OA.A Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from
MP1 Make sense of problems and persevere in solving them
MP2 Reason abstractly and quantitatively
MP3 Construct viable arguments and critique the reasoning of others
MP4 Model with mathematics
MP5 Use appropriate tools strategically
MP6 Attend to precision
MP7 Look for and make use of structure
MP8 Look for and express regularity in repeated reasoning

Crosscutting Concepts
CCC-1 Patterns
CCC-2 Cause and Effect
CCC-3 Scale, Proportion, and Quantity
CCC-6 Structure and Function

Disciplinary Core Ideas
PS3.B Conservation of Energy and Energy Transfer
ESS2.D Weather and Climate
ESS3.B Natural Hazards

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

Science and Engineering Practices
SEP-1 Asking Questions and Defining Problems

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

Environmental Principles and Concepts
Principle I People depend on natural systems
Principle III Natural systems change in ways that people benefit from and can influence
Principle IV There are no permanent or impermeable boundaries that prevent matter from flowing between systems

Common Core English Language Arts
RI.K.1–3 Key Ideas and Details
RI.K.4 Craft and Structure
RI.K.7–8 Integration of Knowledge and Ideas
RI.K.10 Range of Reading and Level of Text Complexity
L.K.6 Vocabulary Acquisition and Use
RF.K.1 Print Concepts
RF.K.4 Fluency
SL.K.1–3 Comprehension and Collaboration
SL.K.4–6 Presentation of Knowledge and Ideas
W.K.2 Text Types and Purposes
W.K.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
K.CC.A Know number names and the count sequence
K.CC.B Count to tell the number of objects
K.CC.C Compare numbers
K.G.A Identify and describe shapes
K.MD.B Classify objects and count the number of objects in each category
K.OA.A Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from
MP1 Make sense of problems and persevere in solving them
MP2 Reason abstractly and quantitatively
MP3 Construct viable arguments and critique the reasoning of others
MP5 Use appropriate tools strategically
MP7 Look for and make use of structure
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

Disciplinary Core Ideas
ESS2.E Biogeology
ESS3.A Natural Resources
ESS3.C Human Impacts on Earth Systems

Engineering, Technology, and Applications of Science
ETS1.A Defining and Delimiting an Engineering Problem
ETS1.B Developing Possible Solutions

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

Science and Engineering Practices
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
Principle II People influence natural systems
Principle III Natural systems change in ways that people benefit from and can influence
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
RI.K.1–3 Key Ideas and Details
RI.K.4 Craft and Structure
RI.K.7–9 Integration of Knowledge and Ideas
RI.K.10 Range of Reading and Level of Text Complexity
L.K.6 Vocabulary Acquisition and Use
RF.K.1 Print Concepts
RF.K.3 Phonics and Word Recognition
RF.K.4 Fluency
RL.K.1 Key Ideas and Details
RL.K.10 Range of Reading and Level of Text Complexity
SL.K.1–3 Comprehension and Collaboration
SL.K.4–6 Presentation of Knowledge and Ideas
W.K.1–2 Text Types and Purposes
W.K.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
K.MD.A Describe and compare measurable attributes
K.CC.A Know number names and the count sequence
K.CC.C Compare numbers
MP1 Make sense of problems and persevere in solving them
MP3 Construct viable arguments and critique the reasoning of others

MY BIG NATURE ADVENTURE

Performance Expectation Progressions

NGSS Topic Arrangements: Interdependent Relationships in Ecosystems

GRADE **K**
MODULE **1**

My Big Nature Adventure covers one NGSS Performance Expectations (PEs) in Life Sciences (K-LS1-1) and one in Earth and Space Sciences (K-ESS3-1).

Students explore the needs of plants and animals, including humans. They identify that living things have survival needs while non-living things do not. Students are introduced to relationships between organisms and their habitats.

Students investigate different habitats and begin to understand that organisms depend on their habitats for their survival needs (e.g., a cactus grows in a desert, a jackrabbit eats the cactus, a hawk eats the jackrabbit). They explore patterns, finding that different organisms live in different habitats.

PROGRESSION ►

CURRENT GRADE	FUTURE KNOWLEDGE			
KINDERGARTEN	**GRADE 2**	**GRADE 3**	**GRADE 5**	**GRADE 6**
Module 4 K-ESS2-2 K-ESS3-3 **I Can** Students build on their understanding from My Big Nature Adventure, that there are relationships between animals (including humans) and the environment. Students learn not only that living things use natural resources from their habitat to survive, but also that using those resources impacts and changes the environment. They are also introduced to the idea that humans can take actions that protect the environment.	**Module 4** 2-LS2-1 2-LS4-1 **A Garden for Life** Students reinforce ideas from Kindergarten about what plants need to survive and grow. They grow plants in different conditions, and create models to explore the interdependence of flowering plants and their pollinators. Students also build on their Kindergarten discoveries about relationships between organisms and where they live. They look for patterns, compare and contrast habitats, and investigate biodiversity.	**Module 3** 3-LS4-1 3-LS4-3 3-LS4-4 **How to Survive an Ice Age** Students explore fossil evidence of organisms from the Pleistocene Ice Age. By comparing fossils to plants and animals alive today, students develop ideas about how the Ice Age organisms met their survival needs. Students revisit ideas from prior grades about the interconnectivity between organisms and their environment. In this module, they investigate the effects of environmental conditions on plant and animal traits. They argue that the ways in which an organism meets its needs make it more or less suited to particular environments. They explore the effects of changes to an environment on its living organisms.	**Module 2** 5-LS1-1 5-LS2-1 **Yellowstone: Uncovered** Students grow plants and formalize their understanding of how plants convert matter (from the air and water) and energy (from the Sun) into "food." They explore ecosystem interdependencies by modeling food chains and food webs, and creating an "ecosystem model" (a self-contained terrarium). They explore how changes to an ecosystem affect all the organisms within the ecosystem and alter the food web.	**Module 3** MS-LS1-5 **The Red List** Students reinforce their ideas about the relationships between organisms and their environment, looking at how environmental conditions affect plant growth.

twig Science | NEXT GEN

MARBLE RUN ENGINEER

Performance Expectation Progressions

NGSS Topic Arrangements: Forces and Interactions; Engineering Design

GRADE **K**
MODULE **2**

Marble Run Engineer covers two NGSS Performance Expectations (PEs) in the Physical Sciences (K-PS2-1 and K-PS2-2) and one in Engineering Design (K-2-ETS1-1).

Students define force as a push or a pull. They discover that using a stronger push or pull causes an object to speed up, slow down, or stop more quickly.

Students experiment with marbles and ramps, and explore marble collisions. They learn about steps in the design process and, after deciding on a challenge, design, build and test their own marble runs to reach their end goal. Throughout the engineering design process, students discuss how interacting with other engineers helps them learn, identify common problems, and improve their designs.

PROGRESSION

FUTURE KNOWLEDGE

GRADE 3	GRADE 4	GRADE 6
Module 1 3-PS2-1 3-PS2-3 3-PS2-4 3–5-ETS1-1 3–5-ETS1-2 3–5-ETS1-3 **The Ultimate Playground** Students explore balanced and unbalanced forces and how forces add up. Students discover that gravity and magnets can push or pull without direct contact. They research, design, build, and test a model of a Dragon Ride that repeats the same pattern of motions every time, and that uses magnetic forces. Finally, synthesizing their design ideas, students create a plan for the Ultimate Playground, with several rides and games that use a variety of forces, including pushes, pulls, magnets, and gravity.	**Module 1** 4-PS3-1 4-PS3-3 3–5-ETS1-3 **Egg Racers** Students build on their understanding of forces and collisions as they are introduced to the abstract concept of energy. Exploring movement and collisions with model cars, students consider the forces involved in energy transfers, such as gravity, friction, pushes, and pulls. They engage in an engineering design challenge to create safety devices to protect an egg during a collision. **Module 4** 4-ESS3-2 3–5-ETS1-1 3–5-ETS1-2 3–5-ETS1-3 **Earthquake Engineering** Students design earthquake-resistant structures. They investigate how various shapes and materials respond to different types of forces, and they apply their findings to their model designs. They conduct tests to determine how well their buildings withstand simulated earthquakes and use the results to help refine their design solutions.	**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.

twig Science | NEXT GEN

BE PREPARED

Performance Expectation Progressions

NGSS Topic Arrangements: Weather and Climate; Engineering Design

GRADE **K**
MODULE **3**

Be Prepared covers two NGSS Performance Expectations (PEs) in Earth and Space Sciences (K-ESS2-1 and K-ESS3-2), two in the Physical Sciences (K-PS3-1 and K-PS3-2), and three in Engineering Design (K–2-ETS1-1, K–2-ETS1-2, and K–2-ETS1-3).

Students investigate weather, record local weather conditions, and discover weather patterns.

Students explore how sunlight warms the Earth's surface and engineer umbrellas using different materials to protect an area from the Sun's warming effects.

Finally, students learn how meteorologists use weather patterns to describe and forecast the weather. They interpret data to identify the severe weather most common in different regions.

PROGRESSION

FUTURE KNOWLEDGE

GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 5	GRADE 6
Module 3 1-PS4-3 **Shadow Town** Students build on ideas from Kindergarten about sunlight. They look at how light creates shadows.	**Module 3** 2-ESS2-1 **Save the Island** Students explore water erosion, they consider the effects of a single, large severe rainstorm versus many small rainstorms. They gather information about a river in Arkansas that flooded when a levee broke during a severe storm.	**Module 4** 3-ESS2-1 3-ESS2-2 3-ESS3-1 **Weather Warning HQ** Students extend their understanding of weather from Kindergarten. They take weather measurements and interpret data about weather conditions to identify seasonal patterns. They define climate and understand how it relates to weather. Students investigate the natural hazards from severe weather.	**Module 2** 4-PS3-2 4-PS3-4 3–5-ETS1-1 **Sparks Energy, Inc.** Students explore an engineering design problem to harness energy from the Sun. They develop computer models to create and run test simulations to analyze different solar cooker designs.	**Module 3** 5-ESS2-1 **H2O Response Team** Students use models, maps, and data to investigate interactions among Earth's systems (e.g., hydrosphere, geosphere). They explore the interactions that cause clouds and rain, and those that can prevent rain in certain areas. **Module 4** 5-ESS1-2 **Galactic Guidebook** Students revisit explorations of sunlight and shadows from Grade 1. They conduct a more detailed Sun shadow investigation, measuring the length and direction of the shadows. They graph and interpret their data to find daily patterns.	**Module 2** MS-ESS2-4 MS-ESS2-5 MS-ESS2-6 MS-PS3-3 MS-ETS1-1 MS-ETS1-3 **Destination Everywhere!** Building on Grade 5, students investigate the water cycle and find that complex interactions between Earth's systems cause weather and climate. They create models to show the role of energy from the Sun in driving the water cycle. They analyze data about how energy transfers in different materials, and use this understanding, to design and refine models of passive solar homes.

twig Science | NEXT GEN

I CAN

Performance Expectation Progressions

NGSS Topic Arrangements: Interdependent Relationships in Ecosystems

GRADE **K**
MODULE **4**

I Can covers two NGSS Performance Expectations (PEs) in Earth and Space Sciences (K-ESS2-2 and K-ESS3-3) and one in Engineering Design (K–2-ETS1-1).

Students collect and discuss evidence about how features in the environment are altered by plants, animals, and humans. They consider cause-and-effect relationships in environmental changes.

Students are introduced to the idea that humans can take action to protect the environment. To apply their understanding, they develop solutions to protect the environment in their school or home.

PROGRESSION ►

PRIOR KNOWLEDGE	FUTURE KNOWLEDGE				
KINDERGARTEN	**GRADE 2**	**GRADE 3**	**GRADE 4**	**GRADE 5**	**GRADE 6**
Module 1 K-LS1-1 K-ESS3-1 **My Big Nature Adventure** Students explore plants and animals and their survival needs. They discover that living organisms interact with and depend on their environment.	**Module 3** 2-ESS1-1 2-ESS2-1 K–2-ETS1-2 **Save the Island** Students build on the idea from Kindergarten that the environment changes. They investigate natural processes that shape and transform Earth, such as volcanic eruptions, landslides, glaciers, and erosion. They explore the effects of erosion and sea level rise on Tangier Island, Virginia. Students investigate engineering solutions (e.g., seawalls, breakwaters) that people have developed to protect the land from erosion, evaluating each solution against their design criteria.	**Module 3** 3-LS4-1 3-LS4-3 3-LS4-4 **How to Survive an Ice Age** Students deepen their understanding of change by investigating the last Ice Age. They discover that many Pleistocene environmental conditions and organisms were very different from those found in the same areas today. Students develop the idea (from Kindergarten and Grade 2) that humans can protect the environment. They explore the effects of introducing invasive, non-native species to an ecosystem, and the ways humans can address this problem.	**Module 3** 4-ESS1-1 4-ESS2-1 **Time-Traveling Tour Guides** Students further explore how environments change over time. They delve more deeply into erosion and are introduced to weathering. Students observe changes through interactive maps of Earth and by creating models of water and wind erosion.	**Module 3** 5-ESS3-1 3–5-ETS1-1 3–5-ETS1-2 3–5-ETS1-3 **H2O Response Team** Students explore how humans impact Earth's systems—the atmosphere, biosphere, geosphere, and hydrosphere. Students research and develop solutions to the problem of limited fresh water. They design, test, and revise iterations of a water-conservation campaign.	**Module 4** MS-ESS3-3 MS-ESS3-5 MS-ETS1-1 **Cities of the Future** Students investigate tools to track environmental changes (e.g., biomonitoring). They assess the impacts people have on Earth, such as pollution, deforestation, and climate change, and how Earth's environment and its natural resources can be protected. Students develop design criteria for building a new town or city that minimizes the possible harmful effects of humans on the environment. They design a solution and assess the viability of their design, and then calculate its likely environmental impact.

twig Science | NEXT GEN

twig Science | NEXT GEN Grade 1 Scope and Sequence

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.

ASSESSMENT All modules include: Pre-Exploration, Formative Assessment, Performance Task, and Multiple Choice Assessment

NGSS

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

CROSS-CURRICULAR CONNECTIONS

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
RL.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
SL1.4–5 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

MUSEUM OF LEAFOLOGY

Performance Expectation Progressions

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

GRADE 1
MODULE 1

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.

twig Science | NEXT GEN

ANIMAL REPORTERS

Performance Expectation Progressions

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

GRADE 1
MODULE 2

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.

SHADOW TOWN

Performance Expectation Progressions

NGSS Topic Arrangements: Waves

GRADE 1
MODULE 3

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.

twig Science | NEXT GEN

PATTERNS IN THE SKY

Performance Expectation Progressions

NGSS Topic Arrangements: Space Systems

GRADE **1**
MODULE **4**

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.

twig Science | NEXT GEN

twig Science | NEXT GEN Grade 2 Scope and Sequence

MODULES	MODULE PHENOMENON	STORYLINE	PERFORMANCE EXPECTATIONS (*PEs that integrate traditional science content with engineering through SEPs or DCIs)
1: My Journey West **NGSS Topic Arrangements: Earth's Systems** 	How can we understand and describe the land and water on Earth?	It's time to hit the road! Students uncover a time capsule buried in the 1930s by seven-year-old Ruthie, detailing her family's journey across the United States. Through diary entries, videos, images, and audio clips, students follow Ruthie from the dust bowl of Oklahoma to her new life in California, learning about the landscape on the way. Students explore the amazing landforms she passes through, and build model landscapes out of clay. They find out how water influences the physical environment, and learn about what maps look like and how they are used.	**2-ESS2-2** Develop a model to represent the shapes and kinds of land and bodies of water in an area. **2-ESS2-3** Obtain information to identify where water is found on Earth and that it can be solid or liquid.
2: Master of Materials **NGSS Topic Arrangements: Structure and Properties of Matter; Engineering Design** 	How can we describe materials as different from one another and understand how their properties relate to their use?	Students work through a series of levels and unlock badges to become "Masters of Materials." They progress from Junior Researchers, who can describe, compare and sort materials, to Professors of Properties, who use what they've learned to design and build bridges. They also become engineers by building and testing towers, and discover how the properties of materials can change by making their own crayons. Only when all five levels are complete will students be able to call themselves Masters!	**2-PS1-1** Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. **2-PS1-2** Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.* **2-PS1-3** Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. **2-PS1-4** Construct an argument with evidence that some changes in matter, caused by mixing, heating, or cooling can be reversed and some cannot. **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.
3: Save the Island **NGSS Topic Arrangements: Earth's Systems; Engineering Design** 	How do natural processes shape the Earth?	The world is changing all around us. Sometimes this puts communities at risk, so scientists and engineers work hard to protect us—whether it's finding ways to hold back floods, or stopping beaches disappearing from right before our eyes. In this module, students investigate the fast and slow ways that landforms change, discover some of the engineering solutions used to slow down or prevent erosion, and apply what they've learned to the island of Tangier in Virginia. Tangier is at risk of disappearing beneath the waves as a result of coastal erosion—can your students come up with ideas to help?	**2-ESS1-1** Use information from several sources to provide evidence that Earth events can occur quickly or slowly. **2-ESS2-1** Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.* **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.
4: A Garden for Life **NGSS Topic Arrangements: Interdependent Relationships in Ecosystems; Engineering Design** 	How do living things in an environment depend on one another and what do they need to grow?	Students create a habitat for plants and animals, by planning and building a school garden! They explore the concept of biodiversity, plan and carry out investigations into what plants need to grow, and use their findings to inform their garden designs. Students also discover the way flowering plants and pollinators such as bees depend on each other, and model the process of pollination in the classroom. Using their new knowledge, students ensure their garden will be the perfect place for pollinators and plants to live and thrive. Let it grow!	**2-LS2-1** Plan and conduct an investigation to determine if plants need sunlight and water to grow. **2-LS2-2** Develop a simple model that mimics the function of an animal when dispersing seeds or pollinating plants.* **2-LS4-1** Make observations of plants and animals to compare the diversity of life in different habitats. **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.

ASSESSMENT All modules include: Pre-Exploration, Formative Assessment, Performance Task, and Multiple Choice Assessment

NGSS

CROSS-CURRICULAR CONNECTIONS

Module 1

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

Disciplinary Core Ideas
ESS2.B Plate Tectonics and Large-Scale System Interactions
ESS2.C The Roles of Water in Earth's Surface Processes

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-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
RI.2.1, 3 Key Ideas and Details
RI.3.4–6 Craft and Structure
RI.2.7–9 Integration of Knowledge and Ideas
RI.2.10 Range of Reading and Level of Text Complexity
L.2.6 Vocabulary Acquisition and Use
SL.2.1–3 Comprehension and Collaboration
SL.2.4–5 Presentation of Knowledge and Ideas
W.2.2 Text Types and Purposes
W.2.5 Production and Distribution of Writing
W.2.7 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
2.G.A Reason with shapes and their attributes
2.MD.A Measure and estimate lengths in standard units
2.MD.D Represent and interpret data
2.NBT.A Understand place value
MP5 Use appropriate tools strategically
MP7 Look for and make use of structure

Module 2

Crosscutting Concepts
CCC-1 Patterns
CCC-2 Cause and Effect
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.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-7 Engaging in Argument from Evidence
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

Common Core English Language Arts
RI.2.1, 3 Key Ideas and Details
RI.3.5, 6 Craft and Structure
RI.2.9 Integration of Knowledge and Ideas
L.2.4–6 Vocabulary Acquisition and Use
RL..2.1 Key Ideas and Details
RL.2.10 Range of Reading and Level of Text Complexity
SL.2.1–3 Comprehension and Collaboration
SL.2.4–6 Presentation of Knowledge and Ideas
W.2.2 Text Types and Purposes
W.2.5 Production and Distribution of Writing
W.2.7–8 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
2.G.A Reason with shapes and their attributes
2.MD.D Represent and interpret data
2.NBT.A Understand place value
2.NBT.B Use place value understanding and properties of operations to add and subtract
2.OA.B Add and subtract within 20
MP1 Make sense of problems and persevere in solving them
MP4 Model with mathematics
MP7 Look for and make use of structure

Module 3

Crosscutting Concepts
CCC-2 Cause and Effect
CCC-3 Scale, Proportion and Quantity
CCC-6 Structure and Function
CCC-7 Stability and Change

Disciplinary Core Ideas
ESS1.C The History of Planet Earth
ESS2.A Earth Materials and Systems

Engineering, Technology, and Applications of Science
ETS1.A Defining and Delimiting an Engineering Problem
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-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 V Decisions affecting resources and natural systems are complex and involve many factors

Common Core English Language Arts
RI.2.1–3 Key Ideas and Details
RI.3.4–6 Craft and Structure
RI.2.7–8 Integration of Knowledge and Ideas
RI.2.10 Range of Reading and Level of Text Complexity
L.2.6 Vocabulary Acquisition and Use
SL.2.1–3 Comprehension and Collaboration
SL.2.4–6 Presentation of Knowledge and Ideas
W.2.1–2 Text Types and Purposes
W.2.7–8 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:
2.MD.C Work with time and money
2.NBT.A Understand place value
MP1 Make sense of problems and persevere in solving them
MP2 Reason abstractly and quantitatively
MP3 Construct viable arguments and critique the reasoning of others

Module 4

Crosscutting Concept
CCC-1 Patterns
CCC-2 Cause and Effect
CCC-6 Structure and Function

Disciplinary Core Ideas
LS2.A Interdependent Relationships in Ecosystems
LS4.D Biodiversity and Humans

Engineering, Technology, and Applications of Science
ETS1.A Defining and Delimiting an Engineering Problem
ETS1.B Developing Possible Solutions

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

Environmental Principles and Concepts
Principle I People depend on natural systems
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
RI.2.1–2 Key Ideas and Details
RI.2.6 Craft and Structure
RI.2.7 Integration of Knowledge and Ideas
RI.2.10 Range of Reading and Level of Text Complexity
L.2.6 Vocabulary Acquisition and Use
SL.2.1–3 Comprehension and Collaboration
SL.2.4–6 Presentation of Knowledge and Ideas
W.2.1–2 Text Types and Purposes
W.2.8 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
2.G.A Reason with shapes and their attributes
2.MD.A Measure and estimate lengths in standard units
2.MD.D Represent and interpret data
MP4 Model with mathematics

MY JOURNEY WEST

Performance Expectation Progressions

NGSS Topic Arrangements: Earth's Systems

GRADE 2
MODULE 1

My Journey West covers two NGSS Performance Expectations (PEs) in Earth and Space Sciences (2-ESS2-2 and 2-ESS2-3). Together, these PEs explore the Earth's features (especially water resources), patterns in their locations, and how to visually represent landforms with models and maps.

Students draw, ask questions about, and describe a variety of landforms (e.g., mountains, valleys, rivers, lakes). They make 3-D models of imagined landscapes. Students then explore 2-D maps and aerial photographs to identify patterns and understand symbols that mapmakers use to illustrate natural and human-made features and convey different types of information. After learning to interpret maps, students create a map representing their own modeled landscape.

Students observe and record patterns of where water is found and how it flows in a landscape using different resources. They investigate water and ice, then plan and conduct an investigation involving melting or freezing.

PROGRESSION

PRIOR KNOWLEDGE	CURRENT GRADE	FUTURE KNOWLEDGE		
KINDERGARTEN	**GRADE 2**	**GRADE 4**	**GRADE 5**	**GRADE 6**
Module 1 K-ESS3-1 **My Big Nature Adventure** Students explore different habitats, such as a desert, grassland, pond, city, and their local area. As students compare habitats, they consider how well each one supports the needs of the plants and animals that live in it, such as the need for water. **Module 4** K-ESS2-2 **I Can** Students investigate ways that features in the environment are changed by humans. They are introduced to the difference between human-made and natural structures. They draw pictures of an environment before and after a human is there.	**Module 2** 2-PS1-4 **Master of Materials** Students further explore how heating and cooling can affect materials. They find that, like water, materials such as wax change properties and can be solid or liquid. They also extend their understandings to include irreversible changes. **Module 3** 2-ESS1-1 2-ESS2-1 **Save the Island** Students describe changes to landscapes that are caused by natural events (e.g., volcanic eruption), and discover how landforms can be shaped by wind or water. This understanding is applied to maps of Tangier Island, Virginia, which is changing due to wave erosion and sea level rise. They also investigate how the flow of water through the land can change dramatically during severe weather.	**Module 3** 4-ESS1-1 4-ESS2-1 4-ESS2-2 **Time-Traveling Tour Guides** Students revisit landforms, using an interactive world map to observe aerial images of Earth taken over three decades. They identify changes to landscapes. Students also create stream trays to observe the effects of water erosion on landforms. They explore the Colorado River and its role in the formation of the Grand Canyon. They investigate the erosive effects of glaciers to understand interactions between ice and the land. Students expand on their understanding that Earth is constantly changing, and that water and ice (as well as wind and living things) affect the shape of landforms and the landscape. **Module 4** 4-ESS2-2 **Earthquake Engineering** Students use maps to discover patterns in the locations of Earth's features (e.g., mountains, tectonic plates). They plot earthquake events and analyze this data to connect patterns in the locations of earthquakes.	**Module 3** 5-ESS2-1 5-ESS2-2 **H2O Response Team** Students use models, maps, and data to investigate Earth systems and how they interact. They look for connections between landforms and a region's weather/climate (e.g., mountain ranges and rainfall). Students explore the uneven distribution of fresh water across Earth, adding new depth and quantitative understanding to their prior learning from Grade 2. They create models to explain what causes the ocean to be salty and explore actions people have taken to protect limited fresh water resources.	**Module 2** MS-ESS2-4 MS-ESS2-5 MS-ESS2-6 **Destination Everywhere!** Students use a variety of maps to more deeply examine interactions among Earth systems. They explore relationships between weather, regional climate, and geology and geography (e.g., altitude, latitude, proximity to a coast, ocean currents, Earth's tilt). They learn more about water's role in Earth systems interactions. Building on their Grade 5 understanding of the hydrosphere, they model evaporation, condensation, transpiration, and the water cycle. They discover that energy from the Sun drives the water cycle, affects ocean currents, and moves air masses.

MASTER OF MATERIALS

Performance Expectation Progressions

NGSS Topic Arrangements: Structure and Properties of Matter; Engineering Design

GRADE 2
MODULE 2

Master of Materials covers four NGSS Performance Expectations (PEs) in the Physical Sciences (2-PS1-1, 2-PS1-2, 2-PS1-3, and 2-PS1-4) and two in Engineering Design (K–2-ETS1-2 and K–2-ETS1-3). Together, these PEs focus on the properties of materials, how materials change when they are heated or cooled, and designing and improving possible solutions to a problem involving materials.

Students explore properties of materials, building on their Kindergarten and Grade 1 understanding of how well different materials let light through. They test everyday items, classifying materials by property and connecting a material's properties to its suitability for a specific purpose.

Students investigate ways that a material's properties can change, such as when it is heated, cooled, or mixed, and focus on distinguishing between reversible and irreversible changes.

Students explore the engineering design process. First, students design and test three tower models, each of different materials. Second, students use the same set of materials to build two different bridges, focusing on a different purpose for each bridge. They test their designs with weights and compare the strength of each bridge design.

PROGRESSION

PRIOR KNOWLEDGE		CURRENT GRADE	FUTURE KNOWLEDGE
KINDERGARTEN	**GRADE 1**	**GRADE 2**	**GRADE 5**
Module 3 K-PS3-2 K–2-ETS1-3 **Be Prepared** Students explore umbrellas of different designs and materials, to decide which is most appropriate for a particular weather condition or situation. Students create umbrella designs using several different materials (e.g., clear plastic, dark paper). They then conduct tests and gather qualitative data to compare how well each design and its material, or combination of materials, shades and cools the ground.	**Module 3** 1-PS4-3 **Shadow Town** Students predict and test what happens when light is shone through different materials (e.g., clear plastic, wax paper, construction paper). Students learn the terms *transparent*, *translucent*, and *opaque*. They explore mirrors and water, and find out that some materials reflect light.	**Module 1** 2-ESS2-3 **My Journey West** Students are introduced to the idea that water can be liquid or solid. They ask questions about melting and freezing, and then conduct investigations to find the answers.	**Module 1** 5-PS1-1 5-PS1-2 5-PS1-3 5-PS1-4 3–5-ETS1-3 **Matter Mysteries Hotline** Students build on their Grade 2 explorations of the properties of materials. They move from observing to measuring properties, in order to identify mystery substances. Students are introduced to materials at the particle level, and create physical models of solids, liquids, and gases. Students conduct investigations in which they combine substances, and then analyze the results to determine changes in the properties, and whether new substances form and chemical reactions occur. They design a clay recipe with specific properties. They use their findings to create, test, and revise several iterations of their clay recipes. Students write a design argument, explaining how well their final recipe meets the design criteria.

SAVE THE ISLAND

Performance Expectation Progressions

NGSS Topic Arrangements: Earth's Systems; Engineering Design

GRADE 2
MODULE 3

Save the Island covers two NGSS Performance Expectations (PEs) in Earth and Space Sciences (2-ESS1-1 and 2-ESS2-1) and two in Engineering Design (K–2-ETS1-1 and K–2-ETS1-2). Together, these PEs address processes that shape and change the Earth's surface, the natural hazards posed by these processes, and engineering solutions that can protect landscapes from erosion.

Students build on their Grade 2 ideas about landforms and their Kindergarten learning about how the environment can change. They begin to examine the effects and time frames involved in different Earth processes: volcanic eruptions, wind and wave erosion, flooding, and glaciers.

In Kindergarten, students learned that natural hazards, such as severe weather, can affect humans. Students extend this understanding, looking at how landscapes are impacted by hazards. They define design criteria to address the problems of wave erosion and sea level rise on Tangier Island, Virginia. Finally, they create models, test solutions, and present results.

PROGRESSION				
PRIOR KNOWLEDGE	**CURRENT GRADE**	**FUTURE KNOWLEDGE**		
KINDERGARTEN	**GRADE 2**	**GRADE 3**	**GRADE 4**	**GRADE 5**
Module 3 K-ESS3-2 **Be Prepared** Students investigate the natural processes that can affect humans. They define severe weather, and read about the hazards posed by different forms of severe weather. They ask questions to understand and prepare for a severe weather scenario. **Module 4** K-ESS2-2 **I Can** Students are introduced to the concept that Earth changes over time. They explore how features in the environment are altered by plants and animals, including humans. They consider cause-and-effect relationships (e.g., between earthworms and soil) in environmental changes.	**Module 1** 2-ESS2-2 **My Journey West** Students study landforms. They learn to represent geological features in sketches, three-dimensional models, and maps. They interpret information about landscapes from images, models, and maps.	**Module 3** 3-LS4-1 3-LS4-4 **How to Survive an Ice Age** Students deepen their understanding of change by investigating the last Ice Age. They discover that many Pleistocene environmental conditions, features, and organisms were very different than those found in the same areas today. Students also model how environmental changes affect living things. **Module 4** 3-ESS3-1 3–5-ETS1-1 3–5-ETS1-2 **Weather Warning HQ** Students revisit natural hazards, focusing on severe weather. They identify relationships between storms and lightning. Students explore ways to reduce the dangers from the natural hazards of lightning and wildfire, and compare the relative effectiveness of different approaches to reducing these hazards and educating people about them.	**Module 3** 4-ESS1-1 4-ESS2-1 4-ESS3-2 3–5-ETS1-2 **Time-Traveling Tour Guides** Students further explore erosion, and are introduced to weathering. They model the creation of landforms along the Colorado River and of rock layers in the Grand Canyon. Teams design, construct, test, and improve designs to protect people and structures from floods. **Module 4** 4-ESS2-2 4-ESS3-2 3–5-ETS1-1 3–5-ETS1-2 3–5-ETS1-3 **Earthquake Engineering** Students discover patterns in the locations of Earth's features (e.g., mountains ranges, tectonic plates) and earthquakes. They research how science and engineering efforts aimed at predicting earthquakes and tsunamis can minimize their effects on people. They create earthquake-resistant buildings, and examine how different shapes and materials respond to earthquakes. They conduct tests to determine how well their structures withstand simulated earthquakes, and use the results to help refine their design solutions.	**Module 3** 5-ESS2-1 **H2O Response Team** Students build on their ideas from previous grades about how natural processes shape Earth. Here they begin to understand that landscapes and Earth processes are part of larger systems. Students explore how these systems—hydrosphere, geosphere, atmosphere, and biosphere—interact, causing not only changing landscapes, but also conditions such as a region's weather and climate.

A GARDEN FOR LIFE

Performance Expectation Progressions

NGSS Topic Arrangements: Interdependent Relationships in Ecosystems; Engineering Design

GRADE 2
MODULE 4

A Garden for Life covers three NGSS Performance Expectations (PEs) in Life Sciences (2-LS2-1, 2-LS2-2, and 2-LS4-1). Together, these PEs investigate habitats and habitat biodiversity, the survival needs of plants, and the relationship between specialized plant parts and reproduction.

Students build on their Kindergarten discovery that organisms depend on their environment. They explore different habitats, define biodiversity, and carry out an investigation comparing the biodiversity in two different areas around school.

Reinforcing ideas from Kindergarten and Grade 1 about what plants need to survive and grow, they design and conduct experiments in which they grow plants under different conditions, strengthening their abilities to use science practices.

Students further explore plant and animal structures, focusing on the features that support plant reproduction. They make models to show the connection between the shape and color of a flower and the structures of its pollinators (e.g., long thin beak, fuzzy legs). Finally, they plan a pollinator garden.

PROGRESSION				
PRIOR KNOWLEDGE		**FUTURE KNOWLEDGE**		
KINDERGARTEN	**GRADE 1**	**GRADE 3**	**GRADE 5**	**GRADE 6**
Module 1 K-LS1-1 **My Big Nature Adventure** Students investigate plants and animals. They observe that plants need sunlight and water to grow. They identify that living things have needs to survive and non-living things do not. Students study different habitats (e.g., a desert, a grassland, a city), discovering that organisms live in habitats where they can get what they need to survive.	**Module 1** 1-LS1-1 **Museum of Leafology** Students build on ideas (from Kindergarten) about living and non-living things. By growing plants from seeds, they revisit plants' survival needs. They discover that flowering plants grow from seeds, and that seed dispersal is important to that process. They create models to show how the shape, size, and other features of a seed are related to its method of dispersal.	**Module 3** 3-LS3-2 3-LS4-1 3-LS4-3 3-LS4-4 **How to Survive an Ice Age** Students revisit concepts about interdependence. They investigate the effects of environmental conditions on plant and animal traits. Through Ice Age fossil evidence and a computer simulation, students identify the effects of environment change on individual species and on habitat biodiversity. By comparing evidence from fossils to plants and animals alive today, they develop ideas about how the Ice Age organisms met their survival needs.	**Module 2** 5-LS1-1 5-LS2-1 **Yellowstone: Uncovered** Students deepen their understanding of the relationships between plants, animals, and the environment. They investigate how changes to an ecosystem affect all the organisms within the ecosystem and alter the food web. They grow plants to formalize their understanding of how plants get what they need to grow. They understand that plants convert matter (from the air and water) and energy (from the Sun) into "food."	**Module 3** MS-LS1-4 MS-LS1-5 MS-LS3-2 **The Red List** Students reinforce their ideas about the relationships between organisms and their environment, looking at how environmental conditions affect plant growth. They learn more about the ways plants and animals ensure successful reproduction. They are also introduced to sexual and asexual reproduction.

twig Science | NEXT GEN

twig Science | NEXT GEN Grade 3 Scope and Sequence

MODULES	MODULE PHENOMENON	STORYLINE	PERFORMANCE EXPECTATIONS* (*PEs that integrate traditional science content with engineering through SEPs or DCIs)
1: The Ultimate Playground **NGSS Topic Arrangements: Forces and Interactions; Engineering Design** 	How are objects affected by the forces of push and pull?	Students investigate forces and use what they learn to design the most incredible playground ever, with everything from swings and slides to fairground attractions to roller coasters! Through hands-on investigations, texts, and videos, students learn how forces make things move—whether it's making carousels spin or skydivers fall. They investigate how magnets can exert a force without contact, build their own model swings and dumbbells, and even take part in games of tug-of-war. Hold on tight—it's going to be quite a ride!	**3-PS2-1** Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. **3-PS2-2** Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. **3-PS2-3** Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. **3-PS2-4** Define a simple design problem that can be solved by applying ideas involving magnets.* **3–5-ETS1-1** Define a simple design problem reflecting a need or want that includes specified criteria for success and constraints on materials, time, or cost. **3–5-ETS1-2** Generate and compare possible solutions to a problem based on how well each it likely to meet the criteria and constraints of the problem. **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.
2: Welcome to the Biodome **NGSS Topic Arrangements: Inheritance and Variation of Traits** 	How do plants' and animals' life cycles help them to survive?	Can't visit the rain forest? Then let the rain forest come to you! Students join the Biodome—a state-of-the-art greenhouse that mimics a tropical rain forest environment—and discover the wide variety of life that rain forests contain. They look after plants in the Biodome's nursery, and nurture and observe real butterflies throughout their life cycle. Students also study the life cycles of other organisms, and look at the traits that animals of the same species share and inherit. There's a lot to explore—out there, and in here!	**3-LS1-1** Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction and death. **3-LS3-1** Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. **3-LS4-2** Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates and reproducing. **3-LS2-1** Construct an argument that some animals form groups that help members survive.
3: How to Survive an Ice Age **NGSS Topic Arrangements: Interdependent Relationships in Ecosystems** 	What is the relationship between an organism and its environment?	Students take a trip thousands of years back in time, to see what the American landscape was like during the last Ice Age. They discover mammoths, saber-toothed cats, and more, and ask the question: Why did some plants and animals go extinct at the end of the last Ice Age, while others survived? Students investigate how environments affect the organisms living in them by planting their own seeds and varying the environmental conditions. They also consider the specific traits that help organisms survive in their environment.	**3-LS3-2** Use evidence to support the explanation that traits can be influenced by the environment. **3-LS4-1** Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. **3-LS4-3** Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. **3-LS4-4** Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.* **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. **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.
4: Weather Warning HQ **NGSS Topic Arrangements: Weather and Climate** 	What is the weather like around the world?	Students become experts in weather and climate by answering calls to Weather Warning HQ. Set up to help people in the local community, Weather Warning HQ handles all kinds of queries—from when to hold an outdoor gala event, to which time of year is best for a jungle expedition. Students find the answers by using weather tools, examining weather and climate data, and making observations. They explore local weather conditions and weather patterns around the world, and help shape a public awareness campaign about the risks associated with lightning.	**3-ESS2-1** Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. **3-ESS2-2** Obtain and combine information to describe climates in different regions of the world. **3-ESS3-1** Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.* **3–5-ETS1-1** Define a simple design problem reflecting a need or want that includes specified criteria for success and constraints on materials, time, or cost. **3–5-ETS1-2** Generate and compare multiple possible solutions to a problem based on how well each it likely to meet the criteria and constraints of the problem.

ASSESSMENT All modules include: Pre-Exploration, Formative Assessment, Performance Task, Multiple Choice Assessment, and Benchmark Assessment

NGSS

Crosscutting Concepts
CCC-1 Patterns
CCC-2 Cause and Effect
CCC-4 Systems and System Models

Disciplinary Core Ideas
PS2.A Forces and Motion
PS2.B Types of Interactions

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-6 Constructing Explanations and Designing Solutions
SEP-7 Engaging in Argument from Evidence
SEP-8 Obtaining, Evaluating, and Communicating Information

CROSS-CURRICULAR CONNECTIONS

Common Core English Language Arts
RI.3.1, 3 Key Ideas and Details
RI.3.8 Integration of Knowledge and Ideas
L.3.6 Vocabulary Acquisition and Use
SL.3.1, 3 Comprehension and Collaboration
SL.3.4–5 Presentation of Knowledge/Ideas
W.3.1–2 Text Types and Purposes
W.3.8 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
3.MD.B Represent and interpret data
MP1 Make sense of problems and persevere in solving them
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

Disciplinary Core Ideas
LS1.B Growth and Development of Organisms
LS2.D Social Interactions and Group Behavior
LS3.A Inheritance of Traits
LS3.B Variation of Traits
LS4.B Natural Selection

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

Common Core English Language Arts
RI.3.1–3 Key Ideas and Details
RI.3.4–6 Craft and Structure
RI.3.7, 9 Integration of Knowledge/Ideas
L.3.1–2 Conventions of Standard English
L.3.6 Vocabulary Acquisition and Use
SL.3.1–3 Comprehension and Collaboration
SL.3.5 Presentation of Knowledge and Ideas
W.3.1–2 Text Types and Purposes
W.3.4 Production and Distribution of Writing
W.3.7–8 Research to Build and Present Knowledge
W.3.10 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
3.MD.A Solve problems involving measurement and estimation
3.MD.B Represent and interpret data
3.NBT.A Use place value understanding and properties of operations to perform multi-digit arithmetic
MP1 Make sense of problems and persevere in solving them.
MP3 Construct viable arguments and critique the reasoning of others
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
LS2.C Ecosystem Dynamics, Functioning, and Resilience
LS3.A Inheritance of Traits
LS3.B Variation of Traits
LS4.B Natural Selection
LS4.A Evidence of Common Ancestry and Diversity
LS4.C Adaptation
LS4.D Biodiversity and Humans

Engineering, Technology, and Applications of Science
ETS1.B Developing Possible Solutions

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 V Decisions affecting resources and natural systems are complex and involve many factors

Common Core English Language Arts:
RI.3.1–3 Key Ideas and Details
RI.3.5 Craft and Structure
RI.3.7–9 Integration of Knowledge and Ideas
RI.3.10 Range of Reading and Level of Text Complexity
L.3.4, 6 Vocabulary Acquisition and Use
SL.3.1–3 Comprehension and Collaboration
SL.3.4–5 Presentation of Knowledge/Ideas
W.3.1–2 Text Types and Purposes
W.3.5 Production and Distribution of Writing
W.3.7–8 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
3.MD.A Solve problems involving measurement and estimation.
3.MD.B Represent and interpret data.
3.MD.C Geometric measurement
MP2 Reason abstractly and quantitatively
MP4 Model with mathematics
MP5 Use appropriate tools strategically

Crosscutting Concepts
CCC-1 Patterns
CCC-2 Cause and Effect

Disciplinary Core Ideas
ESS2.D Weather and Climate
ESS3.B Natural Hazards

Engineering, Technology, and Applications of Science
ETS1.A Defining and Delimiting Engineering Problems
ETS1.B Developing Possible Solutions

Science and Engineering Practices
SEP-1 Asking Questions and Defining Problems
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

Environmental Principles and Concepts
Principle II People influence natural systems
Principle V Decisions affecting resources and natural systems are complex and involve many factors

Common Core English Language Arts
RI.3.1–3 Key Ideas and Details
RI.3.7, 9 Integration of Knowledge and Ideas
RI.3.10 Range of Reading and Level of Text Complexity
L.3.6 Vocabulary Acquisition and Use
SL.3.1–3 Comprehension and Collaboration
SL.3.4–6 Presentation of Knowledge and Ideas
W.3.7–8 Research to Build and Present Knowledge
W.3.10 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
3.MD.B Represent and interpret data.
3.OA.D Solve problems involving the four operations, and identify and explain patterns in arithmetic
MP2 Reason abstractly and quantitatively
MP4 Model with mathematics
MP6 Attend to precision
MP7 Look for and make use of structure

THE ULTIMATE PLAYGROUND

Performance Expectation Progressions

NGSS Topic Arrangements: Forces and Interactions; Engineering Design

GRADE 3
MODULE 1

The Ultimate Playground covers four NGSS Performance Expectations (PEs) in the Physical Sciences (3-PS2-1, 3-PS2-2, 3-PS2-3, and 3-PS2-4) and three in Engineering Design (3–5-ETS1-1, 3–5-ETS1-2, and 3–5-ETS1-3). Together, these PEs explore the relationship between forces and motion, as well as ways to use this relationship in the design of games and rides.

Students apply multiple forces to an object or person, exploring balanced and unbalanced forces and how forces add up. They kick balls and build swings to learn more about forces when objects collide and predictable patterns of motion.

Students investigate gravitational and magnetic forces. They apply their understanding of forces and motion in two design challenges. Using magnets, student teams plan and construct two versions of the same tabletop game and compare their designs. Students develop criteria for a Dragon Ride—a fairground ride that uses magnetic forces and repeats the same pattern of motions time and time again. Finally, they research, design, build, and test a model of their ride.

PROGRESSION

PRIOR KNOWLEDGE	FUTURE KNOWLEDGE		
KINDERGARTEN	**GRADE 4**	**GRADE 5**	**GRADE 6**
Module 2 K-PS2-1 K-PS2-2, K–2-ETS1-1 **Marble Run Engineer** Students investigate push and pull forces. They discover that using a stronger push or pull causes an object to speed up or slow down more quickly and that collisions cause changes in direction and/or speed. Students learn about steps in the design process. They start to define a problem they can solve with a marble run, and after deciding on a challenge, teams design and build their own marble runs, testing and reiterating their designs.	**Module 1** 4-PS3-1 4-PS3-3 3–5-ETS1-3 **Egg Racers** Students build on their understanding of forces and are introduced to the concept of energy. Exploring movement and collisions with model cars, they consider the forces involved in energy transfers, such as gravity, friction, pushes, and pulls. Students engage in an engineering design challenge to create and test inventions (using fair test procedures) to protect their egg racers from the forces involved and energy transferred during a collision. **Module 4** 4-ESS3-2 3–5-ETS1-1 3–5-ETS1-2 3–5-ETS1-3 **Earthquake Engineering** Students design earthquake-resistant structures. They investigate how various shapes and materials respond to different types of forces, and they apply their findings to model designs. Teams conduct tests to determine how well their buildings withstand simulated earthquakes and use the results to help refine their design solutions.	**Module 4** 5-PS2-1 **Galactic Guidebook** Students revisit their understanding of the force of gravity. They conduct investigations to observe patterns in how dropped objects fall and develop visual models and written explanations to show that Earth's gravitational force pulls to the center of the planet. Students use evidence to discuss why people do not fall off Earth.	**Module 2** MS-ESS2-4 **Destination Everywhere!** Students explore energy of motion (kinetic energy) in terms of particle motion. Through investigations, they find that more kinetic energy equals higher temperature. They explore the water cycle in terms of kinetic energy and gravity. They model energy transfers in evaporation, condensation, transpiration, and the water cycle.

WELCOME TO THE BIODOME

Performance Expectation Progressions

NGSS Topic Arrangements: Inheritance and Variation of Traits

GRADE 3
MODULE 2

Welcome to the Biodome covers four NGSS Performance Expectations (PEs) in Life Sciences (3-LS1-1, 3-LS2-1, 3-LS3-1, and 3-LS4-2). They examine plant and animal life cycles, inheritance of traits, survival advantages due to trait variation, and animal behaviors. (Module 3, How to Survive an Ice Age addresses environmental influences on traits.)

Students explore life cycles, building on ideas from Kindergarten and Grade 1 that plants and animals grow and have offspring. They discover that different organisms have different life cycles.

Students revisit trait inheritance from Grade 1 to understand how traits are acquired from both parents. They investigate how trait variation (such as coloration) can give individuals a survival advantage.

Students compare the social lives of various species, and develop arguments about why some organisms form communities, e.g., for protection or to get food.

PROGRESSION

PRIOR KNOWLEDGE			CURRENT GRADE	FUTURE KNOWLEDGE	
KINDERGARTEN	**GRADE 1**	**GRADE 2**	**GRADE 3**	**GRADE 5**	**GRADE 6**
Module 1 K-LS1-1 **My Big Nature Adventure** Students are introduced to animals and identify that, to survive and grow, animals have needs, such as food and water. Students define living and non-living.	**Module 1** 1-LS3-1 **Museum of Leafology** Students review living and non-living things, and the needs of plants. Students grow plants and discover that they change as they develop. They discover that plants of the same kind look similar but are not identical, and that young plants look very like their parents, even though their traits can vary. **Module 2** 1-LS1-2 1-LS3-1 **Animal Reporters** Students confirm that adult animals can have offspring. They investigate animal parenting, and explore different ways in which animals defend themselves and their young. Students deepen their understanding of traits, inheritance, and variation.	**Module 4** 2-LS2-1 2-LS2-2 **A Garden for Life** Students reinforce ideas from Kindergarten and Grade 1 that plants need sunlight and water to survive and grow. They design experiments to grow plants under different conditions, and model plant and animal structures that support plant reproduction.	**Module 3** 3-LS3-2 **How to Survive an Ice Age** Students discover that some traits come from factors other than inheritance. They examine traits affected by environmental conditions and apply different conditions to growing plants, and then record the effects on their traits (e.g., stem color, number of leaves). Students differentiate between changed traits that are passed on or not pass on to young.	**Module 2** 5-LS1-1 **Yellowstone: Uncovered** Students examine how plants get the materials they need to grow. They explain that plants convert matter (from the air and water) and energy (from the Sun) into "food."	**Module 3** MS-LS1-4 MS-LS1-5 MS-LS3-2 **The Red List** Students learn more about the ways plants and animals ensure successful reproduction. They explore how animal parenting affects offspring survival, and how flowering plants structures increase successful reproduction. Students compare asexual and sexual reproduction, and learn how genetic and environmental factors can affect organisms' growth and survival.

HOW TO SURVIVE AN ICE AGE

Performance Expectation Progressions

NGSS Topic Arrangements: Interdependent Relationships in Ecosystems

GRADE **3**
MODULE **3**

How to Survive an Ice Age covers four NGSS Performance Expectations (PEs) in the Life Sciences (3-LS3-2, 3-LS4-1, 3-LS4-3, and 3-LS4-4) and two in Engineering Design (3–5-ETS1-1 and 3–5-ETS1-2). Together, these PEs examine ways that the environment can influence traits, organisms' adaptation to their environment, how organisms respond to environmental changes, and how humans can protect the environment from these changes.

Students investigate how environmental conditions can affect traits, and how the ways that an organism meets its needs can make it more or less suited to a particular environment.

Students deepen their understanding of how environmental changes affect living things by looking at fossil evidence.

Students build on their Kindergarten and Grade 2 knowledge that people can protect the environment. They explore the effects of introducing invasive, non-native species on an ecosystem and contrast ways humans can address this problem.

PROGRESSION ►

PRIOR KNOWLEDGE		FUTURE KNOWLEDGE		
KINDERGARTEN	**GRADE 2**	**GRADE 4**	**GRADE 5**	**GRADE 6**
Module 1 K-LS1-1 K-ESS3-1 **My Big Nature Adventure** Students are introduced to plants and animals and their survival needs. They discover that living organisms interact with and depend on their environment. **Module 4** K-ESS2-2 K-ESS3-3 K–2-ETS1-1 **I Can** Students learn that living things impact and change the environment. They consider cause-and-effect relationships (e.g., between earthworms and soil) in environmental changes. Students develop solutions to the problem of protecting the environment in their school or at home.	**Module 4** 2-LS4-1 2-LS2-2 **A Garden for Life** Students build on their Kindergarten discovery that organisms depend on their environment. They analyze data to compare different habitats. They carry out an investigation comparing the biodiversity in two different areas around school. Students plan a garden to create a good habitat for pollinators.	**Module 3** 3-5-ETS1-2 **Time-Traveling Tour Guides** Students design and evaluate solutions to protect a model building from wind erosion. After discussing the potential problems caused by flooding, teams design, build, test, and revise an engineering solution to protect people and/or property from floods.	**Module 2** 5-LS2-1 **Yellowstone: Uncovered** Students deepen their understanding of the relationships among plants, animals, and the environment. They examine ecosystem interdependencies, create an ecosystem model, and consider how changes to an ecosystem affect all the organisms and alter the food web. **Module 3** 3–5-ETS1-1 3–5-ETS1-2 3–5-ETS1-3 **H2O Response Team** Students develop solutions to the problem of limited fresh water. They review the engineering design cycle and identify criteria and constraints for the project. Students then design, test, and revise iterations of a water-conservation campaign.	**Module 3** MS-LS1-5 **The Red List** Students reinforce their ideas about the relationships between organisms and their environment by looking at how environmental conditions affect plant growth. **Module 4** MS-ESS3-3 MS-ETS1-1 **Cities of the Future** Students develop design criteria for building a new town or city that minimizes the possible harmful effects of humans on the environment. They design and reiterate a solution, assessing its viability and calculating its likely environmental impact.

WEATHER WARNING HQ

Performance Expectation Progressions

NGSS Topic Arrangements: Weather and Climate

GRADE **3**
MODULE **4**

Weather Warning HQ covers three NGSS Performance Expectations (PEs) in Earth and Space Sciences (3-ESS2-1, 3-ESS2-2, and 3-ESS3-1) and two in Engineering Design (3–5-ETS1-1, 3–5-ETS1-2). Together, these PEs focus on weather and climate, including severe weather.

Students extend their Kindergarten understanding of weather by learning to take and interpret weather condition measurements.

Students create bar graphs and use the data to compare seasonal weather patterns. They revisit weather-related natural hazards, investigated in Grade 2, and focus on the dangers of lightning.

Finally, students explore climate zones and examine the weather conditions that typify the seasons in three different climate zones.

PROGRESSION

PRIOR KNOWLEDGE		FUTURE KNOWLEDGE	
KINDERGARTEN	**GRADE 2**	**GRADE 5**	**GRADE 6**
Module 3 K-ESS2-1 K-PS3-2 **Be Prepared** Students record local weather conditions and use their data to investigate weather patterns. They explore how meteorologists use weather patterns to describe and forecast the weather. Students are introduced to severe weather. They interpret data to identify the severe weather most common in different regions, and apply their learning to ask questions and prepare for a severe weather scenario.	**Module 3** 2-ESS2-1 **Save the Island** Students explore water erosion and consider the effects of a single, large severe rainstorm versus many small rainstorms.	**Module 3** 5-ESS2-1 **H2O Response Team** Students consider how interactions between Earth's systems can cause weather conditions. Using models, maps, and data, they investigate the sphere interactions that cause clouds to form and rain to fall, as well as those that can prevent rain in certain areas.	**Module 2** MS-ESS2-5 MS-ESS2-6 **Destination Everywhere!** Students study air pressure maps, wind, and the weather fronts that form when air masses meet. They investigate how, together, these complex patterns of changes and movements help predict local weather. Students further examine causes of regional climates. Using an interactive map, they look for patterns in temperature, precipitation, latitude, ocean currents, and winds. **Module 4** MS-ESS3-3 MS-ESS3-5 **Cities of the Future** Students explore the claim that humans are causing climate change. They explore evidence of changes to Earth's climate, and compare past and present rates of change. They model the impact of greenhouse gases on the atmosphere. To understand and predict the effects of global warming, students investigate sea level rise and read about regional climate change, storms, and extreme weather.

twig Science | NEXT GEN

twig Science | NEXT GEN Grade 4 Scope and Sequence

MODULES	MODULE PHENOMENON	STORYLINE	PERFORMANCE EXPECTATIONS (*PEs that integrate traditional science content with engineering through SEPs or DCIs)
1: Egg Racers **NGSS Topic Arrangements: Energy; Engineering Design** 	What happens to energy when objects collide?	Crash! Bang! Wham! Students learn about collisions, impacts and safety when they design and build their own race cars with a little help from our cartoon friend, Egg. But can they design and build a car that is safe enough to crash without breaking the egg inside? To do that, students will first have to understand what happens to energy when objects collide, what kinetic energy is, and how shock absorption works.	**4-PS3-1** Use evidence to construct an explanation relating the speed of an object to the energy of that object. **4-PS3-3** Ask questions and predict outcomes about the changes in energy that occur when objects collide. **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.
2: Sparks Energy, Inc. **NGSS Topic Arrangements: Energy; Engineering Design** 	How do people produce and transfer energy for their use?	This is a newsflash! Sparks Energy, Inc. is recruiting intrepid reporters to investigate the energy needs of the United States and beyond. While working as science journalists, students learn about energy sources, discover how people use energy, and find out what impact this has on the environment. They work in teams to research the facts and figures, carry out investigations and interviews, and update their reports as new information comes in. The module ends with students using their knowledge and expertise to write an exclusive article for the Sparks Energy, Inc. website.	**4-ESS3-1** Obtain and combine information to explain that energy and fuels are derived from natural resources and their uses affect the environment. **4-PS3-2** Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. **4-PS3-4** Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* **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. **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.
3: Time-Traveling Tour Guides **NGSS Topic Arrangements: Earth's Systems** 	How have weathering and erosion sculpted some of Earth's most interesting landscapes?	What would you see if you traveled millions of years back in time? In this module, students become Time-Traveling Tour Guides and, with the help of videos and 360-degree imagery, discover how the Grand Canyon was formed. They observe fossils, investigate the effects of wind and water erosion on the landscape, use maps to look at patterns in the Earth's features, and study the course of the mighty Colorado River.	**4-ESS1-1** Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. **4-ESS2-1** Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. **4-ESS2-2** Analyze and interpret data from maps to describe patterns of the Earth's features. **4-ESS3-2** Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.* **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. **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.
4: Earthquake Engineering **NGSS Topic Arrangements: Earth's Systems; Engineering Design** 	How can we reduce the damage caused by earthquakes?	Earthquakes can strike without warning, bringing massive destruction, but knowing where they happen can help reduce the damage caused. Students use an interactive to explore the Earth and investigate where earthquakes happen, collecting and analyzing data to identify patterns. Students find out what makes a strong and stable structure, and use this knowledge to design and build their own earthquake-proof buildings. Using an earthquake shake table, they test their structures and, like real civil engineers, refine their designs before the final build.	**4-PS4-1** Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. **4-ESS2-2** Analyze and interpret data from maps to describe patterns of Earth's features. **4-ESS3-2** Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.* **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. **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. **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.
5: Super Survivors **NGSS Topic Arrangements: Waves; Structure, Function, and Information Processing** 	How do the many parts of my body work together to help me live in the world? Communication involves transferring information through waves or signals.	Can you run as fast as a cheetah, hear as well as an Arctic fox, or see as far as a peregrine falcon? Through a series of videos, informational texts, and hands-on activities, students investigate the incredible world of plants and animals, and find out how they use their amazing structures and systems to survive. Building on their knowledge of information processing, students are then challenged to design a long-distance communication device. Can they use waves, digitization, and binary code to survive on a ship lost at sea?	**4-LS1-1** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. **4-LS1-2** Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways. **4-PS3-2** Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. **4-PS4-1** Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. **4-PS4-2** Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. **4-PS4-3** Generate and compare multiple solutions that use patterns to transfer information.* **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. **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.

ASSESSMENT All modules include: Pre-Exploration, Formative Assessment, Performance Task, Multiple Choice Assessment, and Benchmark Assessment

NGSS

CROSS-CURRICULAR CONNECTIONS

Module 1

Crosscutting Concepts
CCC-2 Cause and Effect
CCC-4 Systems and System Models
CCC-5 Energy and Matter

Disciplinary Core Ideas
PS3.A Definitions of Energy
PS3.B Conservation of Energy and Energy Transfer
PS3.C Relationship Between Energy and Forces

Engineering, Technology, and the Applications of Science
ETS1.A Defining 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.4.1 Key Ideas and Details
SL.4.1 Comprehension and Collaboration
SL.4.4 Presentation of Knowledge and Ideas
W.4.2 Text Types and Purposes
W.4.8–9 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
4.MD.A Solve problems involving measurement and conversion of measurements
MP6 Attend to precision

Module 2

Crosscutting Concepts
CCC-2 Cause and Effect
CCC-4 Systems and System Models
CCC-5 Energy and Matter
CCC-6 Structure and Function

Disciplinary Core Ideas
PS3.A Definitions of Energy
PS3.B Conservation of Energy and Energy Transfer
PS3.D Energy in Chemical Processes and Everyday Life
ESS3.A Natural Resources

Engineering, Technology, and the Applications of Science
ETS1.A Defining 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-7 Engaging in Argument from Evidence
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.4.4 Vocabulary Acquisition and Use
RI.4.1–3 Key Ideas and Details
RI.4.4, 5 Craft and Structure
RI.4.7, 8 Integration of Knowledge and Ideas
SL.4.1, 3 Comprehension and Collaboration
SL.4.5 Presentation of Knowledge and Ideas
W.4.2 Text Types and Purposes
W.4.4, 5 Production and Distribution of Writing
W.4.7, 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
4.NBT.A Generalize place value understanding for multi-digit whole numbers
4.G.A Draw and identify lines and angles, and classify shapes by properties of their lines and angles
4.NF.B Build fractions from unit fractions
4.NF.C Understand decimal notation for fractions, and compare decimal fractions

Module 3

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

Disciplinary Core Ideas
ESS1.C The History of Planet Earth
ESS2.A Earth Materials and Systems
ESS2.E Biogeology
ESS3.B Natural Hazards

Engineering, Technology, and the Applications of Science
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 III Natural systems change in ways that people benefit from and can influence
Principle V Decisions affecting resources and natural systems are complex and involve many factors

Common Core English Language Arts
L.4.4 Vocabulary Acquisition and Use
RI.4.1 Key Ideas and Details
RI.4.4, 5 Craft and Structure
RI.4.7–9 Integration of Knowledge and Ideas
SL.4.4, 5 Presentation of Knowledge and Ideas

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,

Common Core Math
4.MD.A Solve problems involving measurement and conversion of measurements
4.MD.B Represent and interpret data
4.MD.C Geometric measurement: understand concepts of angle and measure angles
4.NBT.A Generalize place value understanding for multi-digit whole numbers
4.NF.C Understand decimal notation for fractions, and compare decimal fractions
4.OA.A Use the four operations with whole numbers to solve problems

Module 4

Crosscutting Concepts
CCC-1 Patterns
CCC-2 Cause and Effect
CCC-4 Systems and System Models
CCC-5 Energy and Matter
CCC-6 Structure and Function

Disciplinary Core Ideas
PS4.A Wave Properties
ESS2.B Plate Tectonics and Large-Scale System Interactions
ESS3.B Natural Hazards

Engineering, Technology, and the Applications of Science
ETS1.A Defining 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

Environmental Principles and Concepts
Principle III Natural systems change in ways that people benefit from and can influence
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
RI.4.1–3 Key Ideas and Details
RI.4.4 Craft and Structure
RI.4.7, 9 Integration of Knowledge and Ideas
SL.4.1–2 Comprehension and Collaboration
SL.4.4–6 Presentation of Knowledge and Ideas
W.4.2, 3 Text Types and Purposes
W.4.4 Production and Distribution of Writing
W.4.7–9 Research to Build and Present Knowledge
W.4.10 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
4.MD.A Solve problems involving measurement and conversion of measurements
4.NBT.B Use place value understanding and properties of operations to perform multi-digit arithmetic

Module 5

Crosscutting Concepts
CCC-1 Patterns
CCC-2 Cause and Effect
CCC-4 Systems and System Models
CCC-5 Energy and Matter
CCC-6 Structure and Function

Disciplinary Core Ideas
LS1.A Structure and Function
LS1.D Information Processing
PS3.A Definitions of Energy
PS3.B Conservation of Energy and Energy Transfer
PS4.A Wave Properties
PS4.B Electromagnetic Radiation
PS4.C Information Technologies and Instrumentation

Engineering, Technology, and the Applications of Science
ETS1.A Defining Engineering Problems
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.4.1–3 Key Ideas and Details
RI.4.4, 5 Craft and Structure
RI.4.7–9 Integration of Knowledge and Ideas
RI.4.10 Range of Reading and Text Complexity
SL.4.1–3 Comprehension and Collaboration
SL.4.4, 5 Presentation of Knowledge and Ideas
W.4.2 Text Types and Purposes
W.4.4, 5 Production and Distribution of Writing
W.4.7, 9 Research to Build and Present Knowledge
W.4.10 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
4.G.A Draw and identify lines and angles, and classify shapes by properties of their lines and angles
4.MD.A Solve problems involving measurement and conversion of measurements
4.NBT.B Use place value understanding and properties of operations to perform multi-digit arithmetic

EGG RACERS

Performance Expectation Progressions

NGSS Topic Arrangements: Energy; Engineering Design

GRADE **4**
MODULE **1**

Egg Racers covers two NGSS Performance Expectations (PEs) in the Physical Sciences (4-PS3-1 and 4-PS3-3) and one in Engineering Design (3–5-ETS1-3). Together, these PEs introduce students to energy.

Students explore the abstract concept of energy, starting with a search for evidence of energy in their classroom. They build model cars and consider the forces involved in energy transfers, such as gravity, friction, pushes, and pulls.

Students explain the relationship between how much energy is transferred to an object and how quickly it moves. They also observe that, in a collision, energy can transfer to the air (e.g, producing sound).

PROGRESSION

PRIOR KNOWLEDGE		CURRENT GRADE	FUTURE KNOWLEDGE	
KINDERGARTEN	**GRADE 3**	**GRADE 4**	**GRADE 5**	**GRADE 6**
Module 2 K-PS2-1 K-PS2-2 **Marble Run Engineer** Students define a force as a push or a pull and learn that using a stronger push or pull causes an object to speed up or to slow down more quickly. Students discover that when objects touch or collide they can push each other, causing changes in direction and/or speed.	**Module 1** 3-PS2-1 **The Ultimate Playground** Students apply multiple forces to objects at one time, exploring balanced and unbalanced forces and how forces add up. Students also discover that gravity and magnets can push or pull without direct contact.	**Module 2** 4-PS3-2 4-PS3-4 **Sparks Energy, Inc.** Students explore how energy transfers can be put to practical use by humans. They learn about wind and water power, and understand that light is evidence of energy transfer. Students build electrical circuits, design a solar cooker to boil water, and build, test, and improve a wind turbine.	**Module 4** 5-PS2-1 **Galactic Guidebook** Students further explore gravity, developing visual models and written explanations to show that the Earth's gravitational force pulls everything to the center of the planet.	**Module 2** MS-PS3-4 MS-ESS2-4 MS-PS3-3 MS-PS3-5 **Destination Everywhere!** Students investigate energy (kinetic energy) in terms of particle motion. They model energy transfer in evaporation, condensation, transpiration, and the water cycle. Students explore thermal energy transfers. They collect and analyze data about how quickly different materials change temperature and design their own passive solar home.

twig Science | NEXT GEN

SPARKS ENERGY, INC.

Performance Expectation Progressions

NGSS Topic Arrangements: Energy; Engineering Design

GRADE 4
MODULE 2

Sparks Energy, Inc. covers two NGSS Performance Expectations (PEs) in the Physical Sciences (4-PS3-2 and 4-PS3-4), one in Earth and Space Sciences (4-ESS3-1), and two in Engineering Design (3–5-ETS1-1 and 3–5-ETS1-2.). Together, these PEs address how humans use energy transfers as well as natural resources for energy or fuel, and the impacts of this use.

Students investigate a variety of energy sources, evaluating their availability, usage, limitations, and renewability. They graph the production and use of energy sources in the United States and explore the environmental effects. Students analyze different solar cooker designs to boil water and engage in an engineering design challenge to build, test, and improve a wind turbine to convert energy of motion to electricity.

PROGRESSION			
PRIOR KNOWLEDGE	**CURRENT GRADE**	**FUTURE KNOWLEDGE**	
KINDERGARTEN	**GRADE 4**	**GRADE 5**	**GRADE 6**
Module 3 K-PS3-1 K-PS3-2 K–2-ETS1-1 K–2-ETS1-2 K–2-ETS1-3 **Be Prepared** Students start to explore energy transfer and the idea that sunlight warms the Earth's surface. Students develop ways to protect an area from the warming effects of the Sun. They design umbrellas and conduct tests to compare how well each material/design shades and cools the ground. **Module 4** K-ESS2-2 K-ESS3-3 **I Can** Students are introduced to relationships between humans and natural resources. They discover that living things use natural resources to survive and are introduced to the idea that humans can act to protect these resources.	**Module 1** 4-PS3-1 **Egg Racers** Students begin to explore the concept of energy. They hunt for evidence of energy in the classroom, build model cars, and consider the forces involved in energy transfers, such as gravity, friction, pushes, and pulls. They explain the relationship between how much energy is transferred to an object and how quickly it moves, they also observe that, in a collision, energy of motion can transfer to the air (e.g., produce sound).	**Module 2** 5-PS3-1 **Yellowstone: Uncovered** Students expand on their Grade 4 understanding of energy transfers and stored energy. They learn about chemical energy and model the flow of energy in an ecosystem. **Module 3** 5-ESS2-2 5-ESS3-1 **H2O Response Team** Students further investigate the relationship between humans and natural resources. They explore human impacts on fresh water resources, such as pollution, and efforts to protect the hydrosphere.	**Module 2** MS-PS3-3 MS-PS3-4 MS-PS3-5 MS-ESS2-4 MS-ETS1-1 MS-ETS1-3 **Destination Everywhere!** Students build on ideas about energy transfers within ecosystems, and model how energy transfers are involved in evaporation, condensation, and transpiration. They collect and analyze data about how quickly thermal energy transfers occur in different materials, and use this to design, refine, and evaluate their designs of passive solar homes. **Module 4** MS-ESS3-3 **Cities of the Future** Students revisit ways humans affect natural resources and systems. (e.g., biosphere, hydrosphere). They investigate impacts, such as pollution, deforestation, and climate change, and their effects on living organisms.

TIME-TRAVELING TOUR GUIDES

Performance Expectation Progressions

NGSS Topic Arrangements: Earth's Systems

GRADE **4**
MODULE **3**

Time-Traveling Tour Guides covers NGSS Performance Expectations (PEs) in Earth Science (4-ESS1-1, 4-ESS2-1, 4-ESS2-2, and 4-ESS3-2) and two in Engineering Design (3–5-ETS1-2 and 3–5-ETS1-3).

Students revisit landforms, explored in Grade 2, and investigate erosion and weathering. They use stream trays to model the creation of real-life landforms along the Colorado River and the formation of the Grand Canyon. They observe time-lapse images of the Earth and identify changes to landscapes from natural processes and human development. Students design, build, test, and redesign an engineering solution to protect people and property from floods.

PROGRESSION				
PRIOR KNOWLEDGE			CURRENT GRADE	FUTURE KNOWLEDGE
KINDERGARTEN	GRADE 2	GRADE 3	GRADE 4	GRADE 5
Module 4 K-ESS2-2 **I Can** Students are introduced to the concept that Earth changes over time. They investigate how features in the environment are changed by plants, animals, and humans.	**Module 1** 2-ESS2-2 **My Journey West** Students investigate landforms. They learn to interpret geological features on maps. They create maps and explore ways maps can be used to convey different types of information. **Module 3** 2-ESS1-1 2-ESS2-1 K–2-ETS1-2 **Save the Island** Students build on the idea that plants and animals affect their environment. They explore other factors that shape and change the Earth: wind and water. Students investigate the effects of erosion and sea level rise on Tangier Island, Virginia, and explore how engineering can help protect people from natural processes and hazards.	**Module 4** 3-ESS3-1 3–5-ETS1-1 3–5-ETS1-2 **Weather Warning HQ** Students compare the relative effectiveness of different approaches to reducing the dangers from the natural hazards of lightning and wildfire.	**Module 4** 4-ESS2-2 4-ESS3-2 3–5-ETS1-1 3–5-ETS1-2 3–5-ETS1-3 **Earthquake Engineering** Students use maps to discover patterns in the locations of Earth's features. They analyze data to connect patterns in the locations of earthquakes and geological features. They explore how different shapes and materials respond to earthquake effects and use that knowledge to design, build, and test their own earthquake-proof structures.	**Module 3** 5-ESS2-1 **H2O Response Team** Building on their Grade 4 ideas about how water and wind affect Earth, students investigate Earth systems and the ways they interact. They explore geosphere-hydrosphere interactions, such as that landforms (e.g., mountains) can affect a region's weather and climate, and that ocean waves can erode coastlines.

twig Science | NEXT GEN

EARTHQUAKE ENGINEERING

Performance Expectation Progressions

NGSS Topic Arrangements: Earth's Systems; Engineering Design

GRADE **4**
MODULE **4**

Earthquake Engineering introduces one NGSS Performance Expectation (PE) in Physical Sciences (4-PS4-1) and explores two in Earth Sciences (4-ESS2-2 and 4-ESS3-2). These PEs address waves, natural hazards, and the mapping of Earth's features and forces.

Three additional PEs engage students in engineering design: 3–5-ETS1-1, 3–5-ETS1-2, and 3–5-ETS1-3. While aspects of engineering design are addressed in other Grade 4 modules, Earthquake Engineering emphasizes designing structures to solve problems that arise from natural hazards.

► PROGRESSION ►

PRIOR KNOWLEDGE				CURRENT GRADE	FUTURE KNOWLEDGE
KINDERGARTEN	GRADE 1	GRADE 2	GRADE 3	GRADE 4	GRADE 6
Module 2 K-PS2-2 K–2-ETS1-1 **Marble Run Engineer** Students define a force as a push or a pull. They discover that using a stronger push or pull causes an object to speed up or slow down more quickly, and that when objects touch or collide they can push each other, causing changes in direction and/or speed. **Module 3** K-ESS3-2 K–2-ETS1-2 **Be Prepared** Students are introduced to the idea that natural processes can affect humans. They read about natural hazards posed by different forms of severe weather. They ask questions to understand and prepare for a severe weather scenario. They design umbrellas, exploring the connection between choice of materials and specific weather conditions.	**Module 2** 1-PS4-1 **Animal Reporters** Students develop an introductory understanding of sound waves. They investigate everyday objects to produce sounds. They discover that sounds cause objects to move and that all sounds are caused by vibrations.	**Module 1** 2-ESS2-2 **My Journey West** Students learn to interpret geological features on maps. They create maps and explore ways that maps can be used to convey different types of information. **Module 2** 2-PS1-2 K–2-ETS1-3 **Master of Materials** Students build and test the strength of model towers made of different materials. **Module 3** K–2-ETS1-1 **Save the Island** Students explore the effects of erosion and sea-level rise on Tangier Island. They define design criteria to address these problems. Students learn about engineering solutions and evaluate each against their design criteria.	**Module 4** 3-ESS3-1 3–5-ETS1-1 3–5-ETS1-2 **Weather Warning HQ** Students investigate natural hazards from severe weather. They explore the relationship between storms and lightning, and between lightning and hazards such as wildfires. They compare the relative effectiveness of different approaches to reducing hazards and to educating people about them.	**Module 5** 4-PS4-1 **Super Survivors** Students investigate waves in water and sound waves. They model wave motion, exploring patterns of wave amplitude and wavelength. They discover how waves in water transfer energy. They compare the effect of waves on objects in the open ocean versus objects near shore.	**Module 2** MS-ESS2-5 MS-ESS2-6 **Destination Everywhere!** Students explore the causes of weather and regional climates. They look for patterns on an interactive map and identify possible relationships between weather, climate, and geology.

twig Science | NEXT GEN

SUPER SURVIVORS

Performance Expectation Progressions

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

GRADE **4**
MODULE **5**

Super Survivors covers two NGSS Performance Expectations (PEs) in Life Sciences (4-LS1-1 and 4-LS1-2), four in the Physical Sciences (4-PS3-2, 4-PS4-1, 4-PS4-2, and 4-PS4-3), and two in Engineering Design (3–5-ETS1-2 and 3–5-ETS1-3).

Students revisit ideas from Grades 1 and 2 about external plant and animal parts. They model how internal and external parts work together for animal and plant processes. They discover the role of the brain in perceiving, responding to, and recalling information taken in through the senses.

Students investigate the role of light in sight, and reexamine ideas from Grade 1 about waves and sound. They model wave motion, exploring patterns of wave amplitude and wavelength. They also discover that energy can be transferred by waves, including sound.

The Engineering Design Challenge builds on one from Grade 1, where students made communication tools using sound waves. Here, students explore ancient and modern communication techniques and design possible solutions for sending a coded message over a distance.

PROGRESSION

PRIOR KNOWLEDGE			CURRENT GRADE	FUTURE KNOWLEDGE
KINDERGARTEN	**GRADE 1**	**GRADE 2**	**GRADE 4**	**GRADE 6**
Module 1 K-LS1-1 **My Big Nature Adventure** Students are introduced to animals, identifying that animals have needs to survive, such as food and water. They define *living* and *non-living*.	**Module 1** 1-LS1-1 **Museum of Leafology** Students revisit living and non-living things, and the needs of plants. They identify external plant parts and connect them to their roles in meeting a plant's survival needs. They explore ways that shape, size, and other features relate to the functions of a plant's part. **Module 2** 1-LS1-2 1-PS4-1 1-PS4-4 K–2-ETS1-1 K–2-ETS1-2 K–2-ETS1-3 **Animal Reporters** Students investigate animals' external body parts and chart different ways they are used (e.g., to move, for protection, to take in information), focusing on ties between structure and function. Students also develop an introductory understanding of waves. They investigate everyday objects to produce sounds, and discover that all sounds are caused by vibrations. They engineer a communication device to send a message, evaluating and modifying their designs to ensure the sound can be heard from a distance. **Module 3** 1-PS4-3 **Shadow Town** Students investigate objects in boxes and darkened spaces, varying the amount of light. They discover that light moves in a straight line, that objects can only be seen when there is light to illuminate them, and that some materials reflect light.	**Module 4** 2-LS2-2 **A Garden for Life** Students learn more about the structure and function of external plant and animal parts. They observe the parts of plants and animals that depend on each other for survival needs (e.g., flowering plants and pollinators). They identify connections between the structure of the parts in each of the interdependent organisms.	**Module 4** 4-PS4-1 **Earthquake Engineering** Students explore waves to better understand the effects of earthquakes. They model wave motion in water and with a rope, defining amplitude (wave height) and wavelength (distance between wave peaks). They connect the amplitude of seismic waves to the amount of energy the waves transfer.	**Module 1** MS-LS1-1 MS-LS1-2 MS-LS1-3 MS-LS1-8 **BioTech Systems Worldwide** Students build on ideas from previous grades about the relationship between structure and function. They review the term *systems* and further explore how sensory receptors and the brain function together to respond to and remember information. They use evidence to support an argument about the claim that the body is a system of interacting subsystems composed of groups of cells.



twig Science | NEXT GEN Grade 5 Scope and Sequence

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!	**5-PS1-1** Develop a model to describe that matter is made of particles too small to be seen. **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. **5-PS1-3** Make observations and measurements to identify materials based on their properties. **5-PS1-4** Conduct an investigation to determine whether the mixing of two or more substances results in new substances. **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.
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.	**5-LS1-1** Support an argument that plants get the materials they need for growth chiefly from air and water. **5-LS2-1** Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. **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.
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!	**5-ESS2-1** Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. **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. **5-ESS3-1** Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. **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. **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. **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.
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!	**5-PS2-1** Support an argument that the gravitational force exerted by Earth on objects is directed down. **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. **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.

ASSESSMENT All modules include: Pre-Exploration, Formative Assessment, Performance Task, Multiple Choice Assessment, and Benchmark Assessment

NGSS

CROSS-CURRICULAR CONNECTIONS

Row 1

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

Row 2

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

Row 3

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

Row 4

Crosscutting Concepts
CCC-1 Patterns
CCC-2 Cause and Effect
CCC-3 Scale, Proportion, and Quantity
CCC-4 System and System Models
CCC-5 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

MATTER MYSTERIES HOTLINE

Performance Expectation Progressions

NGSS Topic Arrangements: Structure and Properties of Matter; Engineering Design

GRADE **5**
MODULE **1**

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
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. 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.	**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.	**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. 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.

twig Science | NEXT GEN

YELLOWSTONE: UNCOVERED

Performance Expectation Progressions

NGSS Topic Arrangements: Matter and Energy in Organisms and Ecosystems

GRADE 5
MODULE 2

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**
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).	**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.	**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.	**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. **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. **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.

twig Science | NEXT GEN

H2O RESPONSE TEAM

Performance Expectation Progressions

NGSS Topic Arrangements: Earth's Systems; Engineering Design

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**
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.	**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. **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.	**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. **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.	**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.	**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. **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.

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.

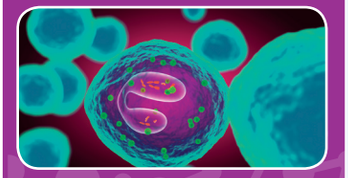
Students revisit their understanding of the force of gravity from Grades 3 and 4. They conduct investigations, develop visual models, and craft written explanations to show that the Earth's gravitational force pulls everything to the center of the planet. They use this evidence to construct an argument 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.

twig Science | NEXT GEN

twig Science | NEXT GEN Grade 6 Scope and Sequence

MODULES	MODULE PHENOMENON	STORYLINE	PERFORMANCE EXPECTATIONS (*PEs that integrate traditional science content with engineering through SEPs or DCIs)
1: BioTech Systems Worldwide **NGSS Topic Arrangements: Structure, Function, and Information Processing; Engineering Design** 	How do human body systems and subsystems work together?	Students become interns at BioTech Systems Worldwide, a bioengineering company working at the interface between human body systems and technology. As part of their training, students explore the relationship between cells, organs, and organ systems, and how they all work together. They apply what they learn from modeling activities, videos, articles, and their own research to produce informational posters and reports, and discover some of the ways technology can be used to repair or replace body parts. Students are then given their first engineering assignment: to design and build a prototype prosthetic hand!	**MS-LS1-1** Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells **MS-LS1-2** Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. **MS-LS1-3** Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. **MS-LS1-8** Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. **MS-ETS1-1** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. **MS-ETS1-2** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
2: Destination Everywhere! **NGSS Topic Arrangements: Weather and Climate; Energy; Engineering Design** 	Weather and climate vary around the world, but we can use science and past trends to predict them.	Travel to some of the most extreme locations on the planet, with Destination Everywhere! Students visit the coldest places, the driest places, and the wettest places—then, they pick a place anywhere in the world, and put together a destination guide all about it. As they travel, students investigate weather and climate around the world. They discover how ocean currents influence global temperatures, why it's cold at the top of mountains, and what causes weather systems. Students also take a tour of the world's climate zones and analyze data to draw conclusions about weather and climate patterns. Happy travels!	**MS-ESS2-4** Develop a model to describe the cycling of water through Earth's systems driven by energy from the Sun and the force of gravity **MS-ESS2-5** Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions. **MS-ESS2-6** Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. **MS-PS3-3** Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.* **MS-PS3-4** Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. **MS-PS3-5** Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. **MS-ETS1-1** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution. **MS-ETS1-3** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution.
3: The Red List **NGSS Topic Arrangements: Growth, Development, and Reproduction of Organisms** 	How do the environment and genetics affect animals and plants?	Students become ecologists, on a mission to save endangered or threatened species from extinction. Through research and investigations, students build their awareness and knowledge of their chosen species and the threats they face. Students study plant and animal reproduction, including courtship behaviors, sexual and asexual methods of reproduction, and the inheritance and variation of traits. They also discover how some animal species look after their offspring to help ensure their survival, and explore how conservationists around the world try to ensure the survival of entire species. Then, it's their turn to come up with a conservation plan of their own.	**MS-LS1-4** Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. **MS-LS1-5** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. **MS-LS3-2** Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
4: Cities of the Future **NGSS Topic Arrangements: Weather and Climate; Human Impacts; Engineering Design** 	How can we reduce harmful impacts on the environment in the places where people live?	Students are tasked with designing an environmentally friendly city of the future. To better understand the need for sustainable cities, they investigate various human impacts on the environment, and the ways these can be minimized. Using three fictionalized case studies, students explore the challenge of balancing the needs of a population with the protection of the natural environment. Students also analyze data to make claims about the causes of climate change and its effects on living things. They explore real-life examples of cities that are trying to make changes for the better.	**MS-ESS3-3** Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.* **MS-ESS3-5** Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. **MS-LS1-4** Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. **MS-LS1-5** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. **MS-ETS1-1** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution. **MS-ETS1-2** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. **MS-ETS1-4** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

ASSESSMENT All modules include: Pre-Exploration, Formative Assessment, Performance Task, Multiple Choice Assessment, and Benchmark Assessment

NGSS

CROSS-CURRICULAR CONNECTIONS

Crosscutting Concepts
CCC-2 Cause and Effect
CCC-3 Scale, Proportion, and Quantity
CCC-4 System and System Models
CCC-6 Structure and Function

Disciplinary Core Ideas
LS1.A Structure and Function
LS1.D Information Processing

Engineering, Technology, and Applications of Science
ETS1.A Defining Engineering Problems
ETS1.B Developing Possible Solutions

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-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.6.1–3 Key Ideas and Details
RI.6.4, 6 Craft and Structure
RI.6.7–9 Integration of Knowledge and Ideas
RI.6.10 Range of Reading and Level of Text Complexity
L.6.6 Vocabulary Acquisition and Use
SL.6.1–2 Comprehension and Collaboration
SL.6.4–6 Presentation of Knowledge and Ideas
W.6.1–2 Text Types and Purposes
W.6.4–5 Production and Distribution of Writing
W.6.7–8 Research to Build and Present Knowledge
W.6.10 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
6.SP.B Summarize and describe distributions
6.NS.B Compute fluently with multi-digit numbers and find common factors and multiples
6.RP.A Understand ratio concepts and use ratio reasoning to solve problems

---

Crosscutting Concepts
CCC-1 Patterns
CCC-2 Cause and Effect
CCC-3 Scale, Proportion, and Quantity
CCC-4 System and System Models
CCC-5 Energy and Matter
CCC-6 Structure and Function
CCC-7 Stability and Change

Disciplinary Core Ideas
ESS2.C The Roles of Water in Earth's Surface Processes
ESS2.D Weather and Climate
PS3.A Definitions of Energy
PS3.B Conservation of Energy and Energy Transfer

Engineering, Technology, and Applications of Science
ETS1.A Defining 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-7 Engaging in Argument from Evidence
SEP-8 Obtaining, Evaluating, and Communicating Information

Environmental Principles and Concepts
Principle I People depend on natural systems
Principle III Natural systems change in ways that people benefit from and can influence
Principle IV There are no permanent or impermeable boundaries that prevent matter from flowing between systems

Common Core English Language Arts
RI.6.1–3 Key Ideas and Details
RI.6.5 Craft and Structure
RI.6.7 Integration of Knowledge and Ideas
L.6.6 Vocabulary Acquisition and Use
SL.6.1–3 Comprehension and Collaboration
SL.6.4–6 Presentation of Knowledge and Ideas
W.6.1–2 Text Types and Purposes
W.6.4–6 Production and Distribution of Writing
W.6.7–9 Research to Build and Present Knowledge
W.6.10 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
6.EE.C Represent and analyze quantitative relationships between dependent and independent variables
6.G.A Solve real-world and mathematical problems involving area, surface area, and volume
6.NS.A Compute fluently with multi-digit numbers
6.NS.C Apply and extend previous understandings of numbers to the system of rational numbers
6.RP.A Understand ratio concepts and use ratio reasoning to solve problems
6.SP.B Summarize and describe distributions

Crosscutting Concepts
CCC-1 Patterns
CCC-2 Cause and Effect
CCC-3 Scale, Proportion, and Quantity
CCC-4 System and System Models
CCC-6 Structure and Function

Disciplinary Core Ideas
LS1.B Growth and Development of Organisms
LS3.A Inheritance of Traits
LS3.B Variation of Traits

Science and Engineering Practices
SEP-1 Asking Questions and Defining Problems
SEP-2 Developing and Using Models
SEP-4 Analyzing and Interpreting Data
SEP-5 Using Math and Computational Thinking
SEP-6 Constructing Explanations and Designing Solutions

Science and Engineering Practices (continued)
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
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
RI.6.1–2 Key Ideas and Details
RI.6.4-6 Craft and Structure
RI.6.7–8 Integration of Knowledge and Ideas
L.6.6 Vocabulary Acquisition and Use
SL.6.1–2 Comprehension and Collaboration
SL.6.4 Presentation of Knowledge and Ideas
W.6.1–2 Text Types and Purposes
W.6.4–5 Production and Distribution of Writing
W.6.6–8 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
6.EE.C Represent and analyze quantitative relationships between dependent and independent variables
6.NS.C Apply and extend previous understandings of numbers to the system of rational numbers
6.RP.A Understand ratio concepts and use ratio reasoning to solve problems
6.SP.A Develop understanding of statistical variability
6.SP.B Summarize and describe distributions

Crosscutting Concepts
CCC-1 Patterns
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
ESS2.D Weather and Climate
ESS3.C Human Impacts on Earth Systems
ESS3.D Global Climate Change
LS1.B Growth and Development of Organisms

Engineering, Technology, and Applications of Science
ETS1.A Defining 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

Science and Engineering Practices (continued)
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 I People depend on natural systems
Principle II People influence natural systems
Principle III Natural systems change in ways that people benefit from and can influence
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
RI.6.1–2 Key Ideas and Details
RI.6.4–5 Craft and Structure
RI.6.7–9 Integration of Knowledge and Ideas
L.6.1 Conventions of Standard English
L.6.6 Vocabulary Acquisition and Use
SL.6.1–2 Comprehension and Collaboration
SL.6.4–5 Presentation of Knowledge and Ideas
W.6.1–2 Text Types and Purposes
W.6.4–5 Production and Distribution of Writing
W.6.7 Research to Build and Present Knowledge
W.6.10 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
6.EE.C Represent and analyze quantitative relationships between dependent and independent variables
6.NS.B Compute fluently with multi-digit numbers and find common factors and multiples
6.NS.C Apply and extend previous understandings of numbers to the system of rational numbers
6.SP.B Summarize and describe distributions

BIOTECH SYSTEMS WORLDWIDE

Performance Expectation Progressions

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

GRADE 6
MODULE 1

BioTech Systems Worldwide covers four NGSS Performance Expectations (PEs) in Life Sciences (MS-LS1-1, MS-LS1-2, MS-LS1-3, and MS-LS1-8) and two in Engineering Design (MS-ETS1-1 and MS-ETS1-2). Together, these PEs explore systems within the human body, component parts of body systems (organs, tissues, and cells), and the use of technology to replace or enhance organs or body parts.

Focusing on humans, students design and model systems to identify body parts and their functions. They draw models to represent the transmission of sensory inputs as signals that travel along nerve cells to the brain and are then processed in the brain, resulting in immediate behaviors or memories.

Students carry out investigations to provide evidence that living things are made of cells—either one cell or many different numbers and types of cells. They model cells and their parts.

Students are presented with a problem: to design and build a prototype of a prosthetic hand that can pick up a water bottle. Working within the constraints of a budget, they sketch their design, build, and test their prosthetic hand. The class then evaluates, compares, and identifies the best design.

► PROGRESSION

PRIOR KNOWLEDGE			CURRENT GRADE
KINDERGARTEN	**GRADE 1**	**GRADE 4**	**GRADE 6**
Module 1 K-LS1-1 **My Big Nature Adventure** Students are introduced to animals, identifying that all animals, including humans, have needs to survive, such as food and water. They define *living* and *non-living*.	**Module 1** 1-LS1-1 K–2-ETS1-1 K–2-ETS1-2 K–2-ETS1-3 **Museum of Leafology** Students investigate biomimicry. They define a problem, use plants to inspire an invention to solve their problem, and then design and build the solution. **Module 2** 1-LS1-2 **Animal Reporters** Students explore how animals have body parts that capture and convey different kinds of information needed for growth and survival. They investigate animals' external body parts and chart the different ways parts are used (e.g., to move, for protection, to eat) with an emphasis on structure and function.	**Module 5** 4-LS1-1 4-LS1-2 **Super Survivors** Students model how external parts and internal organs work together in animals' processes, such as breathing and digestion. They explain how these systems help organisms survive. Students explore the role of the brain in perceiving, responding to, and recalling information taken in through the senses. They discover animals are able to use their perceptions and memories to guide their actions.	**Module 3** MS-LS1-4 **The Red List** Students learn more about the ways animals ensure successful reproduction. They are also introduced to sexual and asexual reproduction.

twig Science | NEXT GEN

DESTINATION EVERYWHERE!

Performance Expectation Progressions

NGSS Topic Arrangements: Weather and Climate; Energy; Engineering Design

GRADE 6
MODULE 2

Destination Everywhere! covers three NGSS Performance Expectations (PEs) in Earth and Space Sciences (MS-ESS2-4, MS-ESS2-5, and MS-ESS2-6), three in the Physical Sciences (MS-PS3-3, MS-PS3-4, and MS-PS3-5), and three in Engineering Design (MS-ETS1–1, MS-ETS1–2, and MS-ETS1–3). Together, these PEs focus on climate and weather, the effects of the Sun on Earth's weather (especially the water cycle), the complexities of predicting weather, and an Engineering Design Challenge involving energy transfers.

Using an interactive map, students look for patterns in temperature, precipitation, latitude, ocean currents, and wind. Building on their Grade 5 understanding of the hydrosphere, they explore the water cycle. They discover that complex interactions between the Earth's systems cause weather and climate.

Students study air pressure maps and learn the effects of high and low pressure on weather. They study the wind and discover that moving air masses create warm and cold fronts, which result in different types of weather.

Students explore the relationship between energy and temperature. Through investigations, they find that more energy equals higher temperature. They experiment with the warming of both sand and water to understand climate. They connect these ideas to particle motion in different materials at different temperatures.

Students work on the Engineering Design Challenge, using energy from the Sun's to keep people warm. They collect and analyze data about how different insulation materials affect the energy transferred to and from a home, and how quickly other materials heat up and cool down. They then apply this understanding to design, evaluate, and refine models of passive solar homes.

► PROGRESSION

PRIOR KNOWLEDGE					CURRENT GRADE
KINDERGARTEN	GRADE 2	GRADE 3	GRADE 4	GRADE 5	GRADE 6
Module 3 K-ESS2-1 K-ESS3-2 K-PS3-1 K-PS3-2 K–2-ETS1-1 K–2 ETS1-2 K–2-ETS1-3 **Be Prepared** Students record local weather conditions using weather symbols. They explore how meteorologists use weather patterns to describe and forecast the weather. Students feel the ground at sunny and shaded spots in the schoolyard to begin to perceive that sunlight warms Earth's surface. They design umbrellas to protect an area from the Sun's warming effects.	**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. **Module 3** 2-ESS2-1 K–2-ETS1-1 K–2-ETS1-2 **Save the Island** Students explore the effects of erosion and sea level rise on Tangier Island, Virginia. They define design criteria to address the problem. Students learn about engineering solutions and evaluate each solution against their design criteria.	**Module 4** 3-ESS2-1 3-ESS2-2 **Weather Warning HQ** Students extend their understanding of weather from Kindergarten by learning to take and interpret weather condition measurements. Students create bar graphs of weather data, and compare seasonal weather patterns. Students explore a map of Earth with climate zones. They identify seasons in the polar, temperate, and tropical zones, and examine the weather conditions that typify the seasons in each of these three climate zones.	**Module 2** 4-PS3-2 4-PS3-4 3–5-ETS1-1 **Sparks Energy, Inc.** Students explore an engineering design problem: how to harness the effects of sunlight and energy transfer from the Sun. Students develop computer models to create and run test simulations, and to analyze different solar cooker designs to boil water.	**Module 3** 5-ESS2-1 **H2O Response Team** Using models, maps, and data, students investigate 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 then model their ideas about what causes the ocean to be salty.	**Module 4** MS-ESS3-5 MS-LS1-5 **Cities of the Future** Students revisit how humans affect Earth's systems. They assess the impact humans have on Earth, such as pollution, deforestation, and climate change. They explore ways to track humans' environmental impact (e.g., biomonitoring), and consider how data can be used to help develop solutions to protect Earth's resources.

THE RED LIST

Performance Expectation Progressions

NGSS Topic Arrangements: Growth, Development, and Reproduction of Organisms

GRADE 6
MODULE 3

The Red List covers three NGSS Performance Expectations (PEs) in Life Sciences (MS-LS1-4, MS-LS1-5, MS-LS3-2). Together, these PEs investigate plant and animal reproduction, genetics, factors that affect an organism's growth, and the protection of endangered species.

Students analyze data to learn more about the ways plants and animals ensure successful reproduction. They formalize their understanding of heredity from previous grades by studying genetics.

Students explore how genes relate to physical characteristics and explain genetic variation in offspring, comparing asexual and sexual reproduction.

Finally, students study the genetic and environmental factors influencing plant and animal growth.

PROGRESSION ►

PRIOR KNOWLEDGE

KINDERGARTEN	GRADE 1	GRADE 2	GRADE 3	GRADE 5
Module 1 K-LS1-1 **My Big Nature Adventure** Students are introduced to relationships between living things and the environment. They begin to understand that organisms depend on their habitat for their needs, and discover that different organisms live in different habitats.	**Module 1** 1-LS1-1 1-LS3-1 **Museum of Leafology** Students examine external plant parts, as well as seeds. They create models to show how the shape, size, and other features of a plant seed are related to its dispersal method. Students investigate similarities and differences between adult plants and their offspring. **Module 2** 1-LS3-1 **Animal Reporters** Students deepen their understanding of traits, inheritance, and variation, contrasting the appearance and physical characteristics of parents and their offspring.	**Module 4** 2-LS2-2 **A Garden for Life** Students explore the relationships between flowering plants and pollinators. They model the connections between the shape and color of a flower and the structures of its pollinators.	**Module 2** 3-LS3-1 3-LS4-2 **Welcome to the Biodome** Students revisit trait inheritance to understand how traits are acquired from both parents. They grow different varieties of plants to explore patterns of trait variation. They also begin to explore how trait variation can give individuals a survival advantage. **Module 3** 3-LS4-3 3-LS4-4 **How to Survive an Ice Age** Students discover that environmental conditions can affect traits (e.g., weasels' white winter fur, wind-shaped trees). They differentiate between changed traits that are/are not passed onto offspring.	**Module 2** 5-LS2-1 **Yellowstone: Uncovered** Students deepen their understanding of the relationships between plants, animals, and the environment. They examine ecosystem interdependencies, and consider how changes to an ecosystem affect all the organisms and alter the food web.

twig Science | NEXT GEN

CITIES OF THE FUTURE

Performance Expectation Progressions

NGSS Topic Arrangements: Weather and Climate; Human Impacts; Engineering Design

GRADE **6**
MODULE **4**

Cities of the Future covers two NGSS Performance Expectations (PEs) in Life Sciences (MS-LS1-4 and MS-LS1-5), two in Earth and Space Sciences (MS-ESS3-3 and MS-ESS3-5), and three in Engineering Design (MS-ETS1-1, MS-ETS1-2, and MS-ETS1-4). Together, these PEs investigate environmental change and ways that we can use science and engineering to monitor and mitigate our environmental impact.

Students revisit how humans affect the Earth's systems and explore solutions to protect the Earth's resources.

They interrogate evidence in order to understand the factors that contribute to climate change and the impacts of climate change on Earth.

Students develop design criteria for building a new town or city that minimizes the potentially harmful effects of humans on the environment. They design a solution, generate data to evaluate and reiterate this design, and work to improve it.

► **PROGRESSION**

PRIOR KNOWLEDGE				**CURRENT GRADE**
KINDERGARTEN	**GRADE 2**	**GRADE 3**	**GRADE 5**	**GRADE 6**
Module 1 K-ESS3-1 **My Big Nature Adventure** Students explore how organisms depend on their habitat for their needs. They study different habitats, and explore the different organisms that live there. **Module 3** K-ESS2-1 K–2-ETS1-1 **Be Prepared** Students investigate the schoolyard and feel the ground in different places. They identify causes for these differences, such as the presence of sunlight or shade, discovering that sunlight warms Earth's surface. This lays foundations for their growing understanding of the Sun's role in Earth's climate and the greenhouse effect. **Module 4** K-ESS2-2 K-ESS3-3 K–2-ETS1-1 **I Can** Students explore how people affect the environment, and are introduced to the idea that humans can protect the environment. To apply their understanding, students identify problems around the school that can be solved by reusing, recycling, or reducing.	**Module 1** 2-ESS2-2 2-ESS2-3 **My Journey West** Students begin to interpret and create maps, laying foundations that they will build on in order to interpret maps that show additional data, such as temperature and precipitation. They observe patterns in the locations of liquid water and ice on Earth. **Module 3** 2-ESS1-1, 2-ESS2-1, K–2-ETS1-1, K–2-ETS1-2 **Save the Island** Students build on the idea that the environment changes. They discover that some environmental changes happen quickly while others happen very slowly. Students explore the effects of erosion and sea level rise on Tangier Island, Virginia. They evaluate different engineering solutions. **Module 4** 2-LS2-1 2-LS4-1 **A Garden for Life** Students build on their understanding that organisms depend on their environment. They discover that organisms can be impacted by changes to their habitats. They apply their learning to the design of a garden for pollinators.	**Module 3** 3-LS4-3 3-LS4-4 **How to Survive an Ice Age** Students develop the idea that people can protect the environment. They investigate the effects of environmental conditions on plant and animal traits, and the effects of environment change on individual species and on habitat biodiversity. **Module 4** 3-ESS2-1 3-ESS2-2 **Weather Warning HQ** Students measure and interpret data about a variety of weather conditions, to identify seasonal and regional patterns. They define climate and understand how it relates to weather.	**Module 2** 5-LS2-1 **Yellowstone: Uncovered** Students examine ecosystem interdependencies, and consider how changes to an ecosystem affect all the organisms and alter the food web. **Module 3** 5-ESS2-1 5-ESS3-1 3–5-ETS1-1 3–5-ETS1-2 3–5-ETS1-3 **H2O Response Team** Students investigate interactions among Earth's systems and how humans impact those systems. They explore sphere interactions that cause clouds to form and rain to fall, and discover how people can protect limited fresh water resources. Students take on an engineering challenge: to design, test, and revise iterations of a water-conservation campaign.	**Module 2** MS-PS3-3 MS-ETS1-1 MS-ETS1-3 **Destination Everywhere!** Building on their understanding of the hydrosphere from Grade 5, students explore the complex interactions between Earth's systems that cause weather and climate. They tackle an engineering design problem: to use the Sun's energy to keep people warm. They design, refine, and evaluate their models of passive solar homes. **Module 3** MS-LS1-4 **The Red List** Students reinforce their ideas about the relationships between organisms and their environment. They explore how changes to the environment can affect plant and animal survival, and they investigate plant and animal interdependencies. They research endangered species and ways to protect them.