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
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

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Standard 1: Social and Instructional Language
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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
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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
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

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Standard 1: Social and Instructional Language
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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.

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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

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.

GRADE 4

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.

GRADE 6

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.

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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.

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** 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.