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

CROSS-CURRICULAR CONNECTIONS

Module 1

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

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

Module 2

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

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-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

Module 4

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.

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