Niagara Falls City School District

Learning For All...Whatever It Takes

Grade 3 - Grade 5

Science Scope and Sequence

Revised 2024

GRADE 3	GRADE 4	GRADE 5
• Interdependent Relationships in Ecosystems • Forces and Interaction • Weather and Climate • Inheritance and Variation of Traits	• Earth's Systems • Waves • Energy • Structure, Function and Information Processing	• Structure and Properties of Matter • Space Systems • Earth's Systems • Matter and Energy in Ecosystems

Understanding the New York State P-12 Science Learning Standards

The New York State P-12 Science Learning Standards are a series of performance expectations that define what students should understand and be able to do as a result of their study of science. The New York State P-12 Science Learning Standards are based on the Framework for K–12 Science Education developed by the National Research Council and the Next Generation Science Standards. The framework outlines three dimensions that are needed to provide students a high-quality science education. The integration of these three dimensions provides students with a context for the content of science, how science knowledge is acquired and understood, and how the sciences are connected through concepts that have universal meaning across the disciplines.

Grade 3	INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS	(Weeks 2-10)

UNIT OVERVIEW

BOCES4Science Program: Where are the Wolves?
The main focus of this unit is the interdependence of organisms in an ecosystem. The anchoring phenomenon is the wolves of Yellowstone. Students learn about how bringing wolves back to Yellowstone National Park significantly changed the park's ecosystem. Students are posed with the question: "Should wolves be brought back to Adirondack Park in New York State?" Students learn about the concerns New York State citizens have with this idea and how wolves would adapt to living in New York. Students use the information learned to take a position on this idea. Fossils are included in this unit. They represent other animals no longer found in New York State. Deforestation is focused on as an environmental change. Students investigate whether solutions to deforestation have merit and would make a positive impact to a changed ecosystem.

PERFORMANCE EXPECTATIONS
Students who demonstrate understanding can:

3-LS2-1. Construct an argument that some animals form groups that help members survive. [Clarification Statement: Examples of groups could include a herd of cattle, a swarm of bees, a flock of geese, a pod of whales, etc.]

3-LS4-1. Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. [Clarification Statement: Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms.] [Assessment Boundary: Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages.]

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. [Clarification Statement: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.]

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.* [Clarification Statement: Examples of environmental changes could include both natural and human-influenced changes in land characteristics, water distribution, temperature, food, and other organisms.] [Assessment Boundary: Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.]

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSS-CUTTING CONCEPTS
Analyzing and Interpreting Data Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. • Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS4-1) **Engaging in Argument from Evidence** Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed worlds. • Construct an argument with evidence, data, and/or a model. (3-LS2-1) • Construct an argument with evidence. (3-LS4-3) • Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (3-LS4-4)	**LS2.C: Ecosystem Dynamics, Functioning, and Resilience** • When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. (secondary to 3-LS4-4) LS2.D: **Social Interactions and Group Behavior** • (NYSED) Being part of a group helps some animals obtain food, defend themselves, and survive. Groups may serve different functions and vary dramatically in size. (Note: Moved from K–2) (3-LS2-1) LS4.A: **Evidence of Common Ancestry and Diversity** • Some kinds of plants and animals that once lived on Earth are no longer found anywhere. (Note: Moved from K–2) (3-LS4-1) • Fossils provide evidence about the types of organisms that lived long	**Cause and Effect** • Cause and effect relationships are routinely identified and used to explain change. (3-LS21),(3-LS4-3) **Scale, Proportion, and Quantity** • Observable phenomena exist from very short to very long time periods. (3-LS4-1) **Systems and System Models** • A system can be described in terms of its components and their interactions. (3-LS4-4) **Connections to Engineering, Technology, and Applications of Science Interdependence of Science, Engineering, and Technology** • Knowledge of relevant scientific concepts and research findings is important in engineering. (3-LS4-4) **Connections to Nature of Science Scientific Knowledge Assumes an Order and Consistency in Natural Systems** • Science assumes consistent patterns in natural systems. (3-LS4-1)

	ago and also about the nature of their environments. (3-LS4-1) LS4.C: **Adaptation** • For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4-3) LS4.D: **Biodiversity and Humans** • Populations live in a variety of habitats and change in those habitats affects the organisms living there. (3-LS4-4)	
DISTRICT RESOURCES BOCES4Science – Where are the Wolves?	**OTHER SUGGESTED ACTIVITIES/RESOURCES** Evidence Statements for 3rd Grade NGSS Evidence Statements provide educators with additional detail on what students should know and be able to do. Claim-evidence-reasoning protocol Generation Genius • Fossils and Extinction • Adaptations • Ecosystems • Animal Group Behavior **BrainPOP Jr** • Habitats • Fossils • Camouflage • Migration • Food Chain	

	• Hibernation **BrainPOP** • Ecosystems
LEARNING TARGETS Learning targets are located at the beginning of each lesson in the BOCES4Science Teacher's Guide.	
VOCABULARY ecosystem, carnivore, herbivore, omnivore, habitat, predator, prey, endangered, extinct, species, adaptation, camouflage, migration, hibernation, alpha, pack, solitary, food chain, food web, deforestation, claim, evidence, reasoning	
ASSESSMENT This unit includes embedded formative assessment (Student Journal) and a final summative assessment (end of unit design project) of their learning. Benchmark Assessment 1: administration window of Nov 12-22	

Grade 3	FORCES AND INTERACTION	(weeks 11-18)

UNIT OVERVIEW

BOCES4Science Program: Invisible Forces
The main topics included in this unit are balanced and unbalanced forces on the motion of an object and how data collected about an object's motion can predict future motion. Cause and effect relationships of electric (static electricity) and magnetic interactions are explored through questioning strategies. The forces of gravity and friction are also introduced in the unit. Magnetism, static electricity, gravity, and friction are all forces that cannot be seen, but we do see their impact. The forces used in a Rube Goldberg machine is the anchoring phenomenon of the unit. Students use the engineering design process to create their own Rube Goldberg machine that incorporates the various forces learned in the unit.

PERFORMANCE EXPECTATIONS
Students who demonstrate understanding can:

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. [Clarification Statement: Examples could include an unbalanced force on one side of an object can make it start moving; and, balanced forces (including friction) acting on a stationary object from both sides will not produce any motion at all.] [Assessment Boundary: Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down.]

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. [Clarification Statement: Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw.] [Assessment Boundary: Assessment does not include technical terms such as period and frequency.]

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. [Clarification Statement: Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one

magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.] [Assessment Boundary: Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.]

3-PS2-4. Define a simple design problem that can be solved by applying scientific ideas about magnets.* [Clarification Statement: Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.]

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSS-CUTTING CONCEPTS
Asking Questions and Defining Problems Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships. • Ask questions that can be investigated based on patterns such as cause and effect relationships. (3-PS2-3) • Define a simple problem that can be solved through the development of a new or improved object or tool. (3-PS2-4) **Planning and Carrying Out Investigations** Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Plan and conduct an investigation collaboratively to produce data to	**PS2.A: Forces and Motion** • Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.) (3-PS2-1) • The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need	**Patterns** • Patterns of change can be used to make predictions. (3-PS2-2) **Cause and Effect** • Cause and effect relationships are routinely identified. (3-PS2-1) • Cause and effect relationships are routinely identified, tested, and used to explain change. (3-PS2-3) ---------- **Connections to Engineering, Technology, and Applications of Science** **Interdependence of Science, Engineering, and Technology** • Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process. (3-PS2-4)

serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-PS2-1) • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (3-PS2-2)	both size and direction to be described is developed.) (3-PS2-2) **PS2.B: Types of Interactions** • Objects in contact exert forces on each other. (3-PS2-1) • Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. (3-PS2-3),(3-PS2-4)	
DISTRICT RESOURCES BOCES4Science – Invisible Forces	**OTHER SUGGESTED ACTIVITIES/RESOURCES** Evidence Statements for 3rd Grade NGSS Evidence Statements provide educators with additional detail on what students should know and be able to do. Claim-evidence-reasoning protocol **Generation Genius** • Balanced and Unbalanced Forces • Patterns and Motion of Friction • Magnets and Static Electricity **BrainPOP** • Forces • Magnetism • Gravity	

LEARNING TARGETS Learning targets are located at the beginning of each lesson in the BOCES4Science Teacher's Guide.	
VOCABULARY Engineer, prototype, force, motion, balanced force, hypothesis, constant, variable, friction, gravity, pendulum, magnet, magnetic field, poles, attract, repel, static electricity	
ASSESSMENT This unit includes embedded formative assessment (Student Journal) and a final summative assessment (end of unit design project) of their learning. Benchmark Assessment 2: administration window of Jan 21-31	

Grade 3	WEATHER AND CLIMATE	(weeks 19-28)

UNIT OVERVIEW

BOCES4Science Program: Investigating Weather and Climate

The main topics included in this unit are investigating the phenomenon of weather, the water cycle, weather-related hazards, and climates in different regions of the world. The class collaborates to plan and conduct an investigation of the weather using weather tools. Students develop a presentation about the weather and climate at a specific global location.

**Students will complete the NYS Required Investigation "Cloud in a Bottle"

PERFORMANCE EXPECTATIONS

Students who demonstrate understanding can:

3-ESS2-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. [Clarification Statement: Examples of data could include average temperature, precipitation, and wind direction.] [Assessment Boundary: Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.]

3-ESS2-2. Obtain and combine information to describe climates in different regions of the world. [Clarification Statement: Emphasis should be on various climates in different regions rather than on localized weather conditions.]

3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.* [Clarification Statement: Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lightning rods.]

3-ESS2-3. Plan and conduct an investigation to determine the connections between weather and water processes in Earth systems. [Clarification Statement: Emphasis should be on the processes that connect the water cycle and weather patterns.]

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSS-CUTTING CONCEPTS
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-ESS2-3) • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (3-ESS2-3) **Analyzing and Interpreting Data** Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. • Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. (3-ESS2-1)	**ESS2.D: Weather and Climate** • Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (3-ESS2-1) • Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (3-ESS2-2) • (NYSED) Earth's processes continuously cycle water, contributing to weather and climate. (3-ESS2-3) **ESS3.B: Natural Hazards** • A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1) (Note: This Disciplinary Core Idea is also addressed by 4-ESS3-2.)	**Patterns** • Patterns of change can be used to make predictions. (3-ESS2-1),(3-ESS2-2) **Cause and Effect** • Cause and effect relationships are routinely identified, tested, and used to explain change. (3-ESS2-3),(3-ESS3-1) **Connections to Engineering, Technology, and Applications of Science Influence of Engineering, Technology, and Science on Society and the Natural World** • (NYSED) Engineers improve existing technologies or develop new ones to increase their benefits (e.g., improved Doppler radar), decrease known risks (e.g., severe weather alerts), and meet societal demands (e.g., cell phone applications). (3-ESS3-1) **Connections to Nature of Science Science is a Human Endeavor** • Science affects everyday life. (3-ESS3-1)

Engaging in Argument from Evidence Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (3-ESS3-1) **Obtaining, Evaluating, and Communicating Information** Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods. • Obtain and combine information from books and other reliable media to explain phenomena. (3-ESS2-2)		
DISTRICT RESOURCES BOCES4Science – Investigating Weather and Climate	**OTHER SUGGESTED ACTIVITIES/RESOURCES** Evidence Statements for 3rd Grade NGSS Evidence Statements provide educators with additional detail on what students should know and be able to do. Claim-evidence-reasoning protocol **Generation Genius** • Water Cycle • Extreme Weather for Kids	

	• Weather vs Climate **BrainPOP Jr** • Seasons • Temperature • Water Cycle **BrainPOP** • Weather
LEARNING TARGETS Learning targets are located at the beginning of each lesson in the BOCES4Science Teacher's Guide.	
VOCABULARY data, forecast, meteorologist, observe, pattern, prediction, weather, drought, flood, hail, lightning, thermometer, temperature, tornado, Celsius, Fahrenheit, rain gauge, anemometer, wind speed, control, experiment, variable, procedure, model, water cycle, condensation, precipitation, water vapor, evaporation, climate, desert, tundra, temperate, tropical	
ASSESSMENT This unit includes embedded formative assessment (Student Journal) and a final summative assessment (end of unit design project) of their learning. Benchmark Assessment 3: administration window of Mar 31-April 11	

Grade 3	INHERITANCE AND VARIATION OF TRAITS: LIFE CYCLES AND TRAITS	(weeks 29-38)

UNIT OVERVIEW

BOCES4Science Program: Generations of Butterflies

In this unit of study, students explore the phenomenon of the monarch migration to Mexico. Lessons within the unit help students figure out that a special generation of monarchs migrate to Mexico over several months even though their adult life span is typically two to three weeks. Additionally, students determine that the butterflies making the trip south do not come back north. A main topic in this unit is life cycles. Students watch butterflies go through their life cycle right in their classroom and collect data on the four stages of their life cycle - birth, growth, reproduction, and death. Another main topic in the unit is inheritance of traits. Variations of these traits provide advantages in surviving, finding mates, and reproducing.

**Students will complete the NYS Required Investigation “Circle of Life”

PERFORMANCE EXPECTATIONS

Students who demonstrate understanding can:

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. [Clarification Statement: Changes organisms go through during their life form a pattern.] [Assessment Boundary: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.]

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. [Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.] [Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.]

3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment. [Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.]

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. [Clarification Statement: Examples of cause and effect relationships could include plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to produce offspring.]

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSS-CUTTING CONCEPTS
Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Develop models to describe phenomena. (3-LS1-1) **Analyzing and Interpreting Data** Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. • Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS3-1) **Constructing Explanations and Designing Solutions**	**LS1.B: Growth and Development of Organisms** • Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1) **LS3.A: Inheritance of Traits** • Many characteristics of organisms are inherited from their parents. (3-LS3-1) • Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. (3LS3-2) • (NYSED) Some characteristics result from the interactions of both inheritance and the effect of the environment. (3-LS3-2) **LS3.B: Variation of Traits**	**Patterns** • Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1) • Patterns of change can be used to make predictions. (3-LS1-1) **Cause and Effect** • Cause and effect relationships are routinely identified and used to explain change. (3-LS3-2),(3-LS4-2)

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. • Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2) • Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2) **Connections to Nature of Science** Scientific Knowledge is Based on Empirical Evidence • Science findings are based on recognizing patterns. (3-LS1-1)	• Different organisms vary in how they look and function because they have different inherited information. (3-LS3-1) • The environment also affects the traits that an organism develops. (3-LS3-2) **LS4.B: Natural Selection** • Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4-2)	
DISTRICT RESOURCES BOCES4Science – Generations of Butterflies NYS Required Investigation "Circle of Life"	**OTHER SUGGESTED ACTIVITIES/RESOURCES** Evidence Statements for 3rd Grade NGSS Evidence Statements provide educators with additional detail on what students should know and be able to do. Claim-evidence-reasoning protocol **Generation Genius** • Variation of Traits • Life Cycles **BrainPOP Jr**	

	• Plant Life Cycle • Butterflies • Frogs • Migration • Camouflage

LEARNING TARGETS

Learning targets are located at the beginning of each lesson in the BOCES4Science Teacher's Guide.

VOCABULARY

migration, survival, life cycle, metamorphosis, larva, pupa, chrysalis, exoskeleton, germinate, root, seed, sprout, fair test, control, variable, hypothesis, investigation, life span, reproduction, acquired trait, inherited trait, organism, adapt, generation, offspring, species, environment, habitat

ASSESSMENT

This unit includes embedded formative assessment (Student Journal) and a final summative assessment (end of unit design project) of their learning.

Benchmark Assessment 4: administration window of June 11-20

Grade 4	EARTH'S SYSTEMS	(weeks 1-13)

UNIT OVERVIEW

BOCES4Science Program: Earth's Processes

In this unit designed for 4th grade, students try to figure out the origin of a bone that is found in local soil. Could it have belonged to a dinosaur? The mystery bone provides an introduction to the main ideas in this unit, such as: rock formations and fossils are evidence of changes in a landscape over time; the effects of weathering and erosion can be observed and measured; the analysis of maps can describe patterns of Earth's features; and that various solutions can be generated that reduce the impacts of natural Earth processes on humans.

PERFORMANCE EXPECTATIONS

Students who demonstrate understanding can:

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. [Clarification Statement: Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; tilted rock layers indicate past crustal movement; glacial scratches on rock formations indicating glacier movement; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.] [Assessment Boundary: Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative 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. [Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water and/or loose Earth materials due to gravity, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.] [Assessment Boundary: Assessment is limited to a single form of weathering or erosion.]

4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features. [Clarification Statement: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.]

4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.* [Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.]

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSS-CUTTING CONCEPTS
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1) **Analyzing and Interpreting Data** Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. • Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2) **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 3– 5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict	**ESS1.C: The History of Planet Earth** • Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1) **ESS2.A: Earth Materials and Systems** • Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) **ESS2.B: Plate Tectonics and Large-Scale System Interactions** • The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different	**Patterns** • Patterns can be used as evidence to support an explanation. (4-ESS1-1),(4ESS2-2) **Cause and Effect** • Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1),(4-ESS3-2) ---------- **Connections to Engineering, Technology, and Applications of Science Influence of Engineering, Technology, and Science on Society and the Natural World** • Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. (4-ESS3-2) ---------- **Connections to Nature of Science Scientific Knowledge Assumes an Order and Consistency in Natural Systems** • Science assumes consistent patterns in natural systems. (4-ESS1-1)

phenomena and in designing multiple solutions to design problems. • Identify the evidence that supports particular points in an explanation. (4-ESS1-1) • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-ESS3-2)	land and water features areas of Earth. (4-ESS2-2) **ESS2.E: Biogeology** • Living things affect the physical characteristics of their regions. (4ESS2-1) **ESS3.B: Natural Hazards** • A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2) (Note: This Disciplinary Core Idea can also be found in 3.WC.) **ETS1.B: Designing Solutions to Engineering Problems** • Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	
DISTRICT RESOURCES BOCES4Science – Earth's Processes	**OTHER SUGGESTED ACTIVITIES/RESOURCES** Evidence Statements for 4th Grade NGSS Evidence Statements provide educators with additional detail on what students should know and be able to do. Claim-evidence-reasoning protocol **Generation Genius**	

	• Earth's Landscapes • Weathering and Erosion • Interactions of Earth's Systems • Extreme Weather Solutions • Natural Disasters • Weather vs Climate Field trip to hike the gorge/Discovery Center

LEARNING TARGETS

Learning targets are located at the beginning of each lesson in the BOCES4Science Teacher's Guide.

VOCABULARY

Prehistoric, fossil, extinct, Geologic Time Scale, sedimentary, shale, limestone, sandstone, conglomerate, bedrock, geologist, deposition, erosion, weathering, gravity, glacier, topographic map, continent, earthquake, plate tectonics, natural disaster, tsunamis, volcano

ASSESSMENT

This unit includes embedded formative assessment (Student Journal) and a final summative assessment (end of unit design project) of their learning.

Benchmark Assessment 1: administration window of Dec 2-13

Grade 4	WAVES	(weeks 14-20)

UNIT OVERVIEW

BOCES4Science Program: Riding the Waves of Information

Students will learn about waves and the properties of amplitude, wavelength, and energy. With these properties, students will learn how waves move objects and transmit information for both sound using Morse code and light using binary code. As a final project, students use the codes to unlock a series of locks to break into a mystery box to reveal a surprise.

PERFORMANCE EXPECTATIONS

Students who demonstrate understanding can:

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. [Clarification Statement: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.] [Assessment Boundary: Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.]

4-PS4-3. Generate and compare multiple solutions that use patterns to transfer information.* [Clarification Statement: Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. ▪ Develop a model using an analogy, example, or abstract representation to describe a scientific principle. (4-PS4-1) **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. ▪ Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-PS4-3) --- ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** ▪ Science findings are based on recognizing patterns. (4-PS4-1)	**PS4.A: Wave Properties** ▪ Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. *(Note: This grade band endpoint was moved from K–2).* (4-PS4-1) ▪ Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). (4-PS4-1) **PS4.C: Information Technologies and Instrumentation** ▪ Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. (4-PS4-3) **ETS1.C: Optimizing The Design Solution** ▪ Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. *(secondary to 4-PS4-3)*	**Patterns** ▪ Similarities and differences in patterns can be used to sort and classify natural phenomena. (4-PS4-1) ▪ Similarities and differences in patterns can be used to sort and classify designed products. (4-PS4-3) --- ***Connections to Engineering, Technology, and Applications of Science*** **Interdependence of Science, Engineering, and Technology** ▪ Knowledge of relevant scientific concepts and research findings is important in engineering. (4-PS4-3)

DISTRICT RESOURCES	OTHER SUGGESTED ACTIVITIES/RESOURCES
BOCES4Science – Riding the Waves of Information	Evidence Statements for 4th Grade NGSS Evidence Statements provide educators with additional detail on what students should know and be able to do. Claim-evidence-reasoning protocol **Generation Genius** • Information Transfer • Wave Properties

LEARNING TARGETS
Learning targets are located at the beginning of each lesson in the BOCES4Science Teacher's Guide.

VOCABULARY Wave, amplitude, energy, wavelength, crest, trough, frequency, radio waves, transmitter, Morse Code, binary code
ASSESSMENT This unit includes embedded formative assessment (Student Journal) and a final summative assessment (end of unit activity) of their learning. Benchmark Assessment 2: administration window of Feb 9-Feb 14

Grade 4	ENERGY	(weeks 21-30)

UNIT OVERVIEW

BOCES4Science Program: Powering Thru the Fair

In Powering thru the Fair, students take a virtual field trip to the NYS Fair in order to investigate the energy used there. They follow a map to visit the roller coaster, ball toss, bumper cars, and more, all the while exploring ideas such as speed, collisions, and energy conversions. As a final performance assessment, students will create exhibits to be displayed at the fair suggesting ideas for making it more eco-friendly. The NYS Fair will award free admission tickets to the winners of this contest.

**Students will complete the NYS Required Investigation "Light It Up"

PERFORMANCE EXPECTATIONS

Students who demonstrate understanding can:

4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object. [Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.]

4-PS3-2. Make observations to provide evidence that energy is conserved as it is transferred and/or converted from one form to another. [Clarification Statement: Examples of forms of energy could include sound, light, heat, and electrical.] [Assessment Boundary: Assessment does not include quantitative measurements of energy.]

4-PS3-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide. [Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.] [Assessment Boundary: Assessment does not include quantitative measurements of energy.]

4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into energy of motion of a vehicle, light, or sound; batteries that convert chemical energy to electrical energy; and, a passive solar heater that converts light into heat. Examples of constraints could

include the materials, cost, or time to design the device.] [Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.]

4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. [Clarification Statement: Examples of renewable energy resources could include wind, water behind dams, and sunlight; nonrenewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels.]

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSS-CUTTING CONCEPTS
Asking Questions and Defining Problems Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships. • Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. (4-PS3-3) **Planning and Carrying Out Investigations** Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K– 2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (4-PS3-2) **Constructing Explanations and Designing Solutions** Constructing explanations and	**PS3.A: Definitions of Energy** • (NYSED) A given object possesses more energy of motion when it is moving faster. (4-PS3-1) • (NYSED) Energy can be transferred by moving objects or by sound, light, heat, or electric currents. (4-PS3-2), (4-PS3-3) **PS3.B: Conservation of Energy and Energy Transfer** • Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2),(4-PS3-3) • (NYSED) Energy can also be transferred by electric currents, which can then be used locally to produce motion, sound, heat, or	**Cause and Effect** • Cause and effect relationships are routinely identified and used to explain change. (4-ESS3-1) **Energy and Matter** • Energy can be transferred in various ways and between objects. (4-PS3-1), (4PS3-2),(4-PS3-3),(4-PS3-4) --- **Connections to Engineering, Technology, and Applications of Science Interdependence of Science, Engineering, and Technology** • Knowledge of relevant scientific concepts and research findings is important in engineering. (4-ESS3-1) **Influence of Engineering, Technology, and Science on Society and the Natural World** • Over time, people's needs and wants change, as do their demands for new and improved technologies. (4-ESS3-1)

designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. • Use evidence (e.g., measurements, observations, patterns) to construct an explanation. (4-PS3-1) • Apply scientific ideas to solve design problems. (4PS3-4) **Obtaining, Evaluating, and Communicating Information** Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluate the merit and accuracy of ideas and methods. • Obtain and combine information from books and other reliable media to explain phenomena. (4-ESS3-1)	light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-2),(4-PS3-4) **PS3.C: Relationship Between Energy and Forces** • When objects collide, the contact forces transfer energy so as to change the objects' motions. (4-PS3-3) **PS3.D: Energy in Chemical Processes and Everyday Life** • The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. (4-PS3-4) **ESS3.A: Natural Resources** • Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1) **ETS1.A: Defining Engineering Problems** • Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features	• Engineers improve existing technologies or develop new ones. (4-PS3-4) ---------- **Connections to Nature of Science Science is a Human Endeavor** • Most scientists and engineers work in teams. (4-PS3-4) • Science affects everyday life. (4-PS3-4)

	of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (secondary to 4-PS3-4)	

DISTRICT RESOURCES	OTHER SUGGESTED ACTIVITIES/RESOURCES
BOCES4Science – Powering Thru the Fair NYS Required Investigation "Light it Up"	Evidence Statements for 4th Grade NGSS Evidence Statements provide educators with additional detail on what students should know and be able to do. Claim-evidence-reasoning protocol **Generation Genius** • Collisions • Potential vs Kinetic Energy • Energy Transfer • Renewable and Nonrenewable Resources

LEARNING TARGETS
Learning targets are located at the beginning of each lesson in the BOCES4Science Teacher's Guide.

VOCABULARY
Energy, chemical, electrical, mechanical, sound, light, heat, speed, collision, conservation, circuit, current, convert, fossil fuels, renewable, non-renewable, solar energy, wind energy, hydropower

ASSESSMENT
This unit includes embedded formative assessment (Student Journal) and a final summative assessment (end of unit design project) of their learning.

Benchmark Assessment 3: administration window of Apr 7-May 2

Grade 4	STRUCTURE, FUNCTION AND INFORMATION PROCESSING	(weeks 31-39)

UNIT OVERVIEW

BOCES4Science Program: A Walk in the Park

In this unit students take walk in a park. They stop to admire wildflowers and learn how the internal and external structures of these plants function to support growth and reproduction. Students continue on their walk making stops along the way to look at different animals. Students study these animals and learn how the animals use their senses to take information from their surroundings and process this information. Special emphasis is placed on the sense of sight. Students realize that animals, like plants, also survive by the interaction between their internal and external structures.

PERFORMANCE EXPECTATIONS

Students who demonstrate understanding can:

4-PS4-2. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. [Assessment Boundary: Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.]

4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]

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. [Clarification Statement: Emphasis is on systems of information transfer.] [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSS-CUTTING CONCEPTS

Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Develop a model to describe phenomena. (4PS4-2) • Use a model to test interactions concerning the functioning of a natural system. (4-LS1-2) **Engaging in Argument from Evidence** Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • Construct an argument with evidence, data, and/or a model. (4-LS1-1)	**PS4.B: Electromagnetic Radiation** • An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2) **LS1.A: Structure and Function** • Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. **(4-LS1-1) LS1.D: Information Processing** • Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2)	**Cause and Effect** • Cause and effect relationships are routinely identified. (4-PS4-2) **Systems and System Models** • A system can be described in terms of its components and their interactions. (4-LS1-1), (LS1-2)
DISTRICT RESOURCES BOCES4Science – A Walk in the Park	**OTHER SUGGESTED ACTIVITIES/RESOURCES** Evidence Statements for 4th Grade NGSS Evidence Statements provide educators with additional detail on what students should know and be able to do. Claim-evidence-reasoning protocol **Generation Genius** • Light, Reflection and Vision • Human Body Systems • Brain Processing of Senses • Structure of Living Things	

	• Adaptations and the Environment
LEARNING TARGETS Learning targets are located at the beginning of each lesson in the BOCES4Science Teacher's Guide.	
VOCABULARY Details will be added when the unit is release from BOCES4Science	
ASSESSMENT This unit includes embedded formative assessment (Student Journal) and a final summative assessment (end of unit design project) of their learning. Benchmark Assessment 4: administration window of June 11-20	

Grade 5	MATTER AND ENERGY IN ORGANISMS AND ECOSYSTEMS	(weeks 1-9)

UNIT OVERVIEW

BOCES4Science Program: Deer, Deer Everywhere

In this unit, Matter and Energy in Organisms and Ecosystems are explored through the lens of deer overpopulation. Students take on the role of NYS Department of Environmental Conservation researchers charged with the task of creating a public service announcement on this issue. During the unit, the students will focus on the Science and Engineering Practices of Developing and Using Models, and Engaging in Argument from Evidence. The unit addresses the Crosscutting Concepts of Systems and System Models, and Energy and Matter.

PERFORMANCE EXPECTATIONS

Students who demonstrate understanding can:

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. [Clarification Statement: Emphasis should be on plants converting light energy by photosynthesis into usable energy. Examples of models could include diagrams and flow charts.]

5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water. [Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.]

5-LS2-1. Develop a model to describe the movement of matter among plants (producers), animals (consumers), decomposers, and the environment. [Clarification Statement: Emphasis is on the flow of energy and cycling of matter in systems such as organisms, ecosystems, and/or Earth.] [Assessment Boundary: Assessment does not include molecular explanations.]

NIAGARA FALLS CITY SCHOOL DSITRICT SCIENCE SCOPE AND SEQUENCE

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSS-CUTTING CONCEPTS
Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Use models to describe phenomena. (5-PS3-1) • Develop a model to describe phenomena. (5-LS2-1) **Engaging in Argument from Evidence** Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • Support an argument with evidence, data, or a model. (5-LS1-1) **Connections to Nature of Science** Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena • Science explanations describe the mechanisms for natural events. (5-LS2-1)	**PS3.D: Energy in Chemical Processes and Everyday Life** • The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (5-PS3-1) **LS1.C: Organization for Matter and Energy Flow in Organisms** • Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (secondary to 5-PS3-1) • Plants acquire their material for growth chiefly from air and water. (5-LS1-1) **LS2.A: Interdependent Relationships in Ecosystems** • The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as “decomposers.” Decomposition	**Systems and System Models** • A system can be described in terms of its components and their interactions. (5-LS2-1) **Energy and Matter** • Matter is transported into, out of, and within systems. (5-LS1-1) • Energy can be transferred in various ways and between objects. (5-PS3-1)

	eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1) **LS2.B: Cycles of Matter and Energy Transfer in Ecosystems** • Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1)	
DISTRICT RESOURCES BOCES4Science – Deer, Deer Everywhere	**OTHER SUGGESTED ACTIVITIES/RESOURCES** Evidence Statements for 5th Grade NGSS Evidence Statements provide educators with additional detail on what students should know and be able to do. Claim-evidence-reasoning protocol **Brainpop** Lesson 1 – Ecosystems Lesson 4 – Photosynthesis Lesson 6 Plant Growth	

	Lesson 7 – Soil Lesson 8 + 9 – Energy Pyramid Lesson 10 – Food Chain **Generation Genius** • Food Webs • How do we use Food?
LEARNING TARGETS Learning targets are located at the beginning of each lesson in the BOCES4Science Teacher's Guide.	
VOCABULARY ecosystems, organism, biodiversity, macroinvertebrate, eco column, niche, producer, photosynthesis, guard cells, stoma(ta), transpiration, constants, control, dependent variable, independent variable, mass, matter, competition, hydroponic, carnivore, consumer, herbivore, omnivore, decomposer, food chain, food web, invasive species, native species, non-native species, over population	
ASSESSMENT This unit includes embedded formative assessment (Student Journal) and a final summative assessment (end of unit design project) of their learning. Benchmark Assessment 1: administration window of Oct 28 -Nov 8	

Grade 5	EARTH'S SYSTEMS	(weeks 10-17)

UNIT OVERVIEW

BOCES4Science Program: Got Water?

In this unit, students investigate Earth's Systems by taking on the role of interns at their local Got Water facility. Students will develop and use system models to explore interactions among Earth's atmosphere, biosphere, geosphere, and hydrosphere. As a final performance assessment, students will obtain, evaluate, and communicate information on environmental conservation issues, then use this information to clean up a water source that has been polluted with various contaminants.

PERFORMANCE EXPECTATIONS

Students who demonstrate understanding can:

5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.]

5-ESS2-2. Describe and graph the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. [Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.]

5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect Earth's resources and environment. [Clarification Statement: Emphasis should be on how communities use information to sustain resources and the environment locally, regionally, nationally, and/or internationally.]

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSS-CUTTING CONCEPTS
Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Develop a model using an example to describe a scientific principle. (5-ESS2-1) **Using Mathematics and Computational Thinking** Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions. • Describe and graph quantities such as area and volume to address scientific questions. (5-ESS2-2) **Obtaining, Evaluating, and Communicating Information** Obtaining, evaluating, and communicating information in 3– 5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods. • Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. (5-ESS3-1**)**	**ESS2.A: Earth Materials and Systems** • Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-1) **ESS2.C: The Roles of Water in Earth's Surface Processes** • Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (5ESS2-2) **ESS3.C: Human Impacts on Earth Systems** • Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help	**Scale, Proportion, and Quantity** • Standard units are used to measure and describe physical quantities such as weight, and volume. (5-ESS2-2) **Systems and System Models** • A system can be described in terms of its components and their interactions. (5-ESS21),(5-ESS3-1) **Connections to Nature of Science** Science Addresses Questions About the Natural and Material World • Science findings are limited to questions that can be answered with empirical evidence. (5ESS3-1)

	protect Earth's resources and environments. (5-ESS3-1)	

DISTRICT RESOURCES	OTHER SUGGESTED ACTIVITIES/RESOURCES
BOCES4Science – Got Water? NYS Required Investigation "Cloud in a Bottle" **For the 25/26 school year only, students will have already completed this investigation.	Evidence Statements for 5th Grade NGSS Evidence Statements provide educators with additional detail on what students should know and be able to do. Claim-evidence-reasoning protocol **BrainPOP**: Lesson 1 – Water cycle Lesson 2 – Oceans Lesson 3 – Earth's Atmosphere Lesson 5 – Water & Climate Types Lesson 7 – Human's and The Environment Lesson 8 – Water supply Lesson 9 – water pollution **Generation Genius** • Water Cycle • Water Quality and Distribution • Interactions of Earth's Spheres

LEARNING TARGETS
Learning targets are located at the beginning of each lesson in the BOCES4Science Teacher's Guide.

VOCABULARY
hydrosphere, inference, observation, glacier, atmosphere, biosphere, geosphere, climate, weather, acid rain, erosion, water cycle, pesticide

ASSESSMENT
This unit includes embedded formative assessment (Student Journal) and a final summative assessment (end of unit design project) of their learning.
Benchmark Assessment 2: administration window of Dec 16-Jan 10

Grade 5	STRUCTURES AND PROPERTIES OF MATTER	(weeks 18-26)

UNIT OVERVIEW

BOCES4Science Program: Toys Matter

This unit explores the Structure and Properties of Matter. Students begin this unit by being welcomed to their first day at the toy company, Toys Matter. They are about to embark on an intensive training program to see if they have what it takes to be hired as Materials Engineers. Throughout the unit, students will complete a series of tasks in which they will explore and work with a large variety of materials. Their final test will be to use what they have learned to engineer a new toy.

**Students will complete the NYS Required Investigation "What's In The Bag?"

PERFORMANCE EXPECTATIONS

Students who demonstrate understanding can:

5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.]

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 amount of matter is conserved. [Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that form new substances. Assume that reactions with any gas production are conducted in a closed system.] [Assessment Boundary: Assessment does not include distinguishing between mass and weight.]

5-PS1-3. Make observations and measurements to identify materials based on their properties. [Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is

not intended as an identifiable property.] [Assessment Boundary: Assessment does not include density or distinguishing between mass and weight.]

5-PS1-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances. [Clarification Statement: Examples could include mixing baking soda and water compared to mixing baking soda and vinegar.]

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSS-CUTTING CONCEPTS
Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Develop a model to describe phenomena. (5-PS1-1) **Planning and Carrying Out Investigations** Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K– 2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (5-PS1-4) • Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3)	**PS1.A: Structure and Properties of Matter** • Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. (5-PS1-1) • (NYSED) The total amount of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2) • Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3)	**Cause and Effect** • Cause and effect relationships are routinely identified, tested, and used to explain change. (5-PS1-4) **Scale, Proportion, and Quantity** • Natural objects exist from the very small to the immensely large. (5-PS1-1) • Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1-2),(5PS1-3) **Connections to Nature of Science** Scientific Knowledge Assumes an Order and Consistency in Natural Systems • Science assumes consistent patterns in natural systems. (5-PS1-2)

Using Mathematics and Computational Thinking Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions. • Measure and graph quantities such as weight to address scientific and engineering questions and problems. (5-PS1-2)	**PS1.B: Chemical Reactions** • When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4) • No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (5PS1-2)	
DISTRICT RESOURCES BOCES4Science – Toys Matter NYS Required Investigation "What's In the Bag?"	**CROSS-CURRICULAR RESOURCES**	**OTHER SUGGESTED ACTIVITIES/RESOURCES** Evidence Statements for 5th Grade NGSS Evidence Statements provide educators with additional detail on what students should know and be able to do. Claim-evidence-reasoning protocol **BrainPOP:** Lesson 2 – Atoms

		Lesson 3 – States of Matter Lesson 4 – Measuring Matter Lesson 7 – Property Change Lesson 8 – Conservation of Mass **Generation Genius** • Conservation of Matter • Particle Nature of Matter • Properties of Matter • Chemical vs Physical Changes
LEARNING TARGETS Learning targets are located at the beginning of each lesson in the BOCES4Science Teacher's Guide.		
VOCABULARY matter, property, particle, gas, liquid, phase, solid, mass, volume, chemical property, physical property, dichotomous key, chemical change, physical change, Law of Conservation of Matter		
ASSESSMENT This unit includes embedded formative assessment (Student Journal) and a final summative assessment (end of unit design project) of their learning.		

Grade 5	SPACE SYSTEMS	(weeks 27-29)

UNIT OVERVIEW

Using Generation Genius, students will explore the universe. They will discover how the appearance of stars is based on their size and distance from Earth and begin to comprehend the vast scale of the universe by comparing the brightness and sizes of stars in the night sky to our sun. Students will learn about the apparent motion of the Earth, sun, stars, and planets by studying observable patterns.

*Students will review for the NYS Science Assessment, given in May. This assessment addressed content from grades 3-5.

PERFORMANCE EXPECTATIONS

Students who demonstrate understanding can:

5-ESS1-1. Support an argument that differences in the apparent brightness of the Sun compared to other stars is due to their relative distances from Earth. [Assessment Boundary: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).]

5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. [Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the Sun, moon, and some stars that are visible only in particular months.] [Assessment Boundary: Assessment does not include causes of seasons.]

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSS-CUTTING CONCEPTS
Analyzing and Interpreting Data Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used.	**PS2.B: Types of Interactions** • The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5-PS2-1) **ESS1.A: The Universe and its Stars**	**Patterns** • Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. (5-ESS1-2) **Cause and Effect**

• Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. (5-ESS1-2) **Engaging in Argument from Evidence** Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • Support an argument with evidence, data, or a model. (5PS2-1),(5-ESS1-1)	• The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. (5-ESS1-1) **ESS1.B: Earth and the Solar System** • The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. (5-ESS1-2)	• Cause and effect relationships are routinely identified and used to explain change. (5-PS2-1) **Scale, Proportion, and Quantity** • Natural objects exist from the very small to the immensely large. (5ESS1-1)
DISTRICT RESOURCES **Generation Genius** • Earth's Orbit and Rotation • Sun and Other Stars	**OTHER SUGGESTED ACTIVITIES/RESOURCES** Evidence Statements for 5th Grade NGSS Evidence Statements provide educators with additional detail on what students should know and be able to do. Claim-evidence-reasoning protocol	
LEARNING TARGETS		

VOCABULARY Orbit, rotation, revolution, axis, pattern, seasons, shadow, solar system, constellation, star, planet, moon, force, gravity
ASSESSMENT A short quiz, online game or exit ticket is available for use at the end of each Generation Genius 5E lesson.

**For the school year 2023/24 Grade 5 will need to do or model the following after the completion of the above curriculum:

- Both grade 3 required investigations (Circle of Life and Cloud in a Bottle)
- Review for NYS assessment

**For the school year 2024/25 Grade 5 will need to do or model the following after the completion of the above curriculum:

- Review for NYS assessment

Grade 5	PHYSICAL SCIENCE	Post-NYS Assessment

UNIT OVERVIEW

Using Generation Genius, students will be introduced to topics related to grade 6 science content. This will be an overview of the content and exposure is the expectation, not mastery.

PERFORMANCE EXPECTATIONS

Students who demonstrate understanding can:

MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. [Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.] [Assessment Boundary: Assessment is limited to the qualitative interpretation of evidence provided.]

MS-PS1-7. Use evidence to illustrate that density is a property that can be used to identify samples of matter. [Clarification Statement: Emphasis should be on students measuring the masses and volumes of regular and irregular shaped objects, calculating their densities, and identifying the samples of matter.]

MS-PS2-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. [Clarification Statement: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.] [Assessment Boundary: Assessment about questions that require quantitative answers is limited to proportional reasoning and algebraic thinking.]

MS-PS2-5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. [Clarification Statement: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could include first-hand experiences or simulations. Emphasis should be on using arrows to represent the directions of

forces.] [Assessment Boundary: Assessment is limited to electric and magnetic fields, and is limited to qualitative evidence for the existence of fields.]

MS-PS3-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. [Clarification Statement: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.] [Assessment Boundary: Assessment is limited to two objects and electric, magnetic, and gravitational interactions.]

MS-PS3-6. Make observations to provide evidence that energy can be transferred by electric currents. [Clarification Statement: Emphasis should be on arrangements of circuit components in series and parallel circuits.] [Assessment Boundary: Assessment will be limited to qualitative analysis and reasoning.]

SCIENCE AND ENGINEERING PRACTICES	DISCIPLINARY CORE IDEAS	CROSS-CUTTING CONCEPTS
Engaging in Argument from Evidence Engaging in argument from evidence in 6–8 builds from K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world. • Construct and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-PS1-7) **Obtaining, Evaluating, and Communicating Information** Obtaining, evaluating, and communicating information in 6– 8 builds on	**PS1.A: Structure and Properties of Matter** • (NYSED) Each substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. (MSPS1-3),(MS-PS1-7) **PS1.B: Chemical Reactions** • (NYSED) Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different particles, and these new substances have different properties from those of the reactants. (MS-PS1-3)	**Patterns** • Macroscopic patterns are related to the nature of microscopic and atomic-level structure. (MS-PS1-7) **Structure and Function** • Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used. (MS-PS1-3) **Connections to Engineering, Technology, and Applications of Science** Interdependence of Science, Engineering, and Technology • Engineering advances have led to important discoveries in virtually every field of science, and scientific

K–5 and progresses to evaluating the merit and validity of ideas and methods. • Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (MS-PS1-3) **Asking Questions and Defining Problems** Asking questions and defining problems in grades 6–8 builds from grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models. • Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles. (MS-PS2-3) **Planning and Carrying Out Investigations** Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.	**PS2.B: Types of Interactions** • Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (MS-PS2-3) • Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively). (MSPS2-5) **PS3.A: Definitions of Energy** • A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2) • (NYSED) An electric circuit is a closed path in which an electric current can exist. (MS-PS3-6)	discoveries have led to the development of entire industries and engineered systems. (MS-PS1-3) **Influence of Science, Engineering and Technology on Society and the Natural World** • The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MSPS1-3) **Cause and Effect** • Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS2- 3),(MS-PS2-5) **Systems and System Models** • Models can be used to represent systems and their interactions – such as inputs, processes, and outputs – and energy and matter flows within systems. (MS-PS3-2) **Energy and Matter** • The transfer of energy can be tracked as energy flows through a designed

• Conduct an investigation and evaluate the experimental design to produce data to serve as the basis for evidence that can meet the goals of the investigation. (MS-PS2-5) • Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions.(MS-PS3-6) **Developing and Using Models** Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems. • Develop a model to describe unobservable mechanisms. (MSPS3-2)		or natural system. (MSPS3-3),(MS-PS3-6)

DISTRICT RESOURCES

Generation Genius

- Properties of Elements
- Electric and Magnetic Fields
- Electricity and Circuits

ASSESSMENT

A short quiz, online game or exit ticket is available for use at the end of each Generation Genius 5E lesson.