

4th Grade Science Pacing Guide

Grade Level	4 th
Subject	Science
Semester 1	Quarter 1 - Life Science
Standards	<ul style="list-style-type: none"> 4.LS2: Ecosystems: Interactions, Energy, and Dynamics <ul style="list-style-type: none"> <i>Support an argument with evidence that plants get the materials they need for growth and reproduction chiefly through a process in which they use carbon dioxide from the air, water, and energy from the sun to produce sugars, plant materials, and waste (oxygen); and that this process is called photosynthesis.</i> <i>Develop models of terrestrial and aquatic food chains to describe the movement of energy among producers, herbivores, carnivores, omnivores, and decomposers.</i> <i>Using information about the roles of organisms (producers, consumers, decomposers), evaluate how those roles in food chains are interconnected in a food web, and communicate how the organisms are continuously able to meet their needs in a stable food web.</i> <i>Develop and use models to determine the effects of introducing a species to, or removing a species from, an ecosystem and how either one can damage the balance of an ecosystem.</i> <i>Analyze and interpret data about changes (land characteristics, water distribution, temperature, food, and other organisms) in the environment and describe what mechanisms organisms can use to affect their ability to survive and reproduce.</i> 4.LS4: Biological Change: Unity and Diversity <ul style="list-style-type: none"> <i>Obtain information about what a fossil is and ways a fossil can provide information about the past.</i> <p>Engineering, Technology, and Applications of Science (ETS) Standards are embedded throughout curriculum:</p> <ul style="list-style-type: none"> 4.ETS1: Engineering Design <ul style="list-style-type: none"> <i>Categorize the effectiveness of design solutions by comparing them to specified criteria for constraints.</i> 4.ETS2: Links Among Engineering, Technology, Science, and Society <ul style="list-style-type: none"> <i>Use appropriate tools and measurements to build a model.</i> <i>Determine the effectiveness of multiple solutions to a design problem given the criteria and the constraints.</i> <i>Explain how engineers have improved existing technologies to increase their benefits, to decrease known risks, and to meet societal demands (artificial limbs, seatbelts, cell phones).</i>
Objectives/I Can Statements	<ul style="list-style-type: none"> I can use the appropriate tools for measurements to build a model. I can determine the effectiveness of multiple solutions. I can explain how engineers have improved existing technologies to increase their benefits, decrease risks, and meet demands of people who live in the community. I can explain how plants get the materials they need to survive and grow. I can describe the systems plants have to transport water and nutrients. I can explain the importance of photosynthesis. I can explain the photosynthesis process. I can model a food chain. I can analyze how organisms relate to one another in food chains. I can explain why organisms need energy and compare how they obtain energy. I can differentiate between producers, consumers, and decomposers.

	<ul style="list-style-type: none"> • I can classify animals as herbivores, carnivores, and omnivores. • I can model and explain how energy is transferred along a food chain. • I can explain what makes up a balanced or healthy ecosystem. • I can explain the interdependence and interactions in an ecosystem. • I can demonstrate how energy flows through an ecosystem. • I can explain how living things depend on nonliving things for survival. • I can describe the different ways that living things interact with one another in the same ecosystem. • I can explain the importance of decomposers in an ecosystem. • I can explain how the disappearance of one species can affect other species in an ecosystem. • I can demonstrate how living and nonliving things are connected in an ecosystem. • I can explain how changes in an environment can affect living things. • I can recognize that some changes to an ecosystem occur rapidly over a period of a few years or less. • I can describe how humans can cause short-term changes to an ecosystem. • I can describe how natural disasters and seasonal changes can cause short-term changes to an ecosystem. • I can recognize that most organisms in an ecosystem are adapted to seasonal changes. • I can explain that changes may be harmful or helpful to the organisms living in an ecosystem. • I can describe and evaluate solutions to problems caused by short-term changes to ecosystems. • I can explain how ecosystems change over time. • I can identify the long-term effects of climate change on an ecosystem. • I can explain how scientists use fossils to show how ecosystems change over time. • I can define the term <i>fossil</i> and identify the major types of fossils. • I can explain how different types of fossils form. • I can describe how scientists use rocks to date fossils. • I can understand what fossils can tell us about the history of Earth and organisms that lived in the past. • I can investigate how long-term changes to an ecosystem can cause living things to adapt to become new species or, more often, become extinct. • I can analyze how behavioral adaptations can affect other living things in the ecosystem.
Topics	<ul style="list-style-type: none"> • Plant Survival: Basic Needs of Plants • Ecosystems: Parts of a Food Chain, Parts of Ecosystems, Interactions in Ecosystems, Short-Term Changes in Ecosystems, Long-Term Changes in Ecosystems • Changing Earth: Fossils
Vocabulary	<ul style="list-style-type: none"> • prey, ecosystem, herbivore, decomposer, consumer, food web, decompose, food chain, system, energy (organisms), carnivore, predator, decay, solar energy, grassland, sun, biological diversity, organism, nutrients, protist, fungus, energy pyramid, photosynthesis, parasite, heterotroph, producer, light, omnivore, bacteria • population, tropical, consumer, model, swamp, interact, habitat, coral reef, natural, abiotic, sun, water, biotic, environment, rain forest, producer, carbon dioxide, niche, community • survive, biodiversity, decay, pollute, species, wetland, recycle • lava, temperature (weather), period, season, earthquake, tsunami, flood, organism, hurricane, tornado, cycle, deposit, deforestation, precipitation, water

	<ul style="list-style-type: none"> extinct, camouflage, fossil, paleontologist, adaptation, evidence, natural microorganism, prehistoric, rock layer, ancient, dinosaur, sedimentary rock, coal, evolve, asteroid, absolute age, preserve light energy, nitrogen, root, stomata, respiration, stem, plant, organism, mineral, fertilize, photosynthesis, reproduce, chloroplast, oxygen, migration, matter, freshwater, chlorophyll, carbon dioxide, hibernate,
Summary of Key Learning Events/Instruction	<ul style="list-style-type: none"> All life is interdependent and interacts with the environment. A rich variety of complex organisms have developed in response to a continually changing environment. Matter and energy flow through the biosphere. Explain how organisms interact through symbiotic, commensal, and parasitic relationships. Analyze the effects of changes in the environment on the stability of an ecosystem. Analyze fossils to demonstrate the connection between organisms and environments that existed in the past and those that currently exist. A rich variety of complex organisms have developed in response to a continually changing environment. Demonstrate that plants require light energy to grow and survive. Investigate different ways that organisms meet their energy needs. Use and discuss texts and other media around the following topics: <i>Food Chains, Food Webs, Ecosystems, Weather, Fossils, Plant Life</i> Conduct developmentally appropriate research and inquiry activities.
Instructional Materials/Resources	<ul style="list-style-type: none"> Discovery Education Techbook Units 3, 5.5, and 4 Trade books www.brainpop.com www.studyjams.scholastic.com/studyjams other resources as determined by grade level team Phet simulations Study Jams Supplemental Resources
Assessment	<ul style="list-style-type: none"> Daily assignments Exit Tickets Individual and group projects Formative assessments Summative assessments

Grade Level	4th
Subject	Science
Semester 1	Quarter 2 - Physical Science
Standards	<ul style="list-style-type: none"> • 4.PS3: Energy <ul style="list-style-type: none"> ○ <i>Use evidence to explain the cause-and-effect relationship between the speed of an object and the energy of an object.</i> ○ <i>Observe and explain the relationship between potential energy and kinetic energy.</i> ○ <i>Describe how stored energy can be converted into another form for practical use.</i> • 4.PS4: Waves and their Application in Technologies for Information Transfer <ul style="list-style-type: none"> ○ <i>Use a model of a simple wave to explain regular patterns of amplitude, wavelength, and direction.</i> ○ <i>Describe how the colors of available light sources and the bending of light waves determine what we see.</i> ○ <i>Investigate how lenses and digital devices like computers or cell phones use waves to enhance human senses.</i> <p>Engineering, Technology, and Applications of Science (ETS) Standards are embedded throughout curriculum:</p> <ul style="list-style-type: none"> • 4.ETS1: Engineering Design <ul style="list-style-type: none"> ○ <i>Categorize the effectiveness of design solutions by comparing them to specified criteria for constraints.</i> • 4.ETS2: Links Among Engineering, Technology, Science, and Society <ul style="list-style-type: none"> ○ <i>Use appropriate tools and measurements to build a model.</i> ○ <i>Determine the effectiveness of multiple solutions to a design problem given the criteria and the constraints.</i> ○ <i>Explain how engineers have improved existing technologies to increase their benefits, to decrease known risks, and to meet societal demands (artificial limbs, seatbelts, cell phones).</i>
Objectives/I Can Statements	<ul style="list-style-type: none"> • I can define energy and how it is used. • I can know that there are seven forms of energy. • I can know how energy is stored, transformed, and transferred. • I can describe ways that wind and air can be used to move things. • I can describe the different ways that humans and other organisms use chemical, solar, electrical, and thermal energy. • I can demonstrate that energy can change forms. • I can explain how energy is conserved by giving examples of ways energy can change form. • I can explain the difference between potential and kinetic energy. • I can describe how energy can be converted into several forms at once. • I can explain the relationship between waves and energy. • I can distinguish among different types of waves. • I can relate wave observations to their characteristics. • I can relate the motion of waves to the motion of objects with which they come in contact. • I can analyze the effects of light hitting a smooth surface. • I can analyze the effects of light hitting a rough surface. • I can demonstrate and explain refraction through different materials. • I can explain how lenses can be used to change the path of light. • I can describe how a prism can be used to separate white light into its component colors.

	<ul style="list-style-type: none"> I can explain the basic process for transmitting signals using sound, electromagnetic waves, and electricity. I can compare analog and digital signals. I can explain how signals can be transmitted over wires and fibers, or through air or space. I can design, test, and modify a system for transmitting information.
Topics	<ul style="list-style-type: none"> Energy: Forms of Energy, Changing the Forms of Energy Waves: Waves, Reflection, Refraction, Information Transfer
Vocabulary	<ul style="list-style-type: none"> work, wavelength, amplitude, crest, trough, frequency fossil fuels, chemical energy, radiation, gravity, nuclear energy, energy (organisms), sound wave, mechanical energy, sound, electric, energy, solar energy, transmit, energy (physical), radiant energy, fuel, kinetic energy, potential energy, gas, nucleus, power, molecule, conservation of energy, light, heat hydroelectric power, motion, power, gravitational potential energy, conservation of energy, thermal energy amplitude, matter, transmit, wave reflect, opaque, pigment, concave, surface, ray, optical, translucent, image, transparent, focal point, prism, convex, lens, color, pupil, spectrum, property, material, optical, focus, image, refract receiver (communications), sound wave, communication system, frequency, electromagnetic spectrum
Summary of Key Learning Events/Instruction	<ul style="list-style-type: none"> Various forms of energy are constantly being transformed into other types without any net loss of energy from the system. Distinguish among heat, radiant, and chemical forms of energy. Use a model of a simple wave to explain regular patterns of amplitude, wavelength, and direction. Investigate how light travels and is influenced by different types of materials and surfaces. Understandings about scientific inquiry and the ability to conduct inquiry are essential for living in the 21st century. Society benefits when engineers apply scientific discoveries to design materials and processes that develop into enabling technologies. Describe how tools, technology, and inventions help to answer questions and solve problems. Recognize that new tools, technology, and inventions are always being developed. Identify appropriate materials, tools, and machines that can extend or enhance the ability to solve a specified problem. Recognize the connection between scientific advances, new knowledge, and the availability of new tools and technologies. Use and discuss texts and other media around the following topics: <i>Forms of Energy, Light and Sound Waves, Communication</i> Conduct developmentally appropriate research and inquiry activities.
Instructional Materials/Resources	<ul style="list-style-type: none"> Discovery Education Techbook Units 1 and 2 Trade books www.brainpop.com www.studyjams.scholastic.com/studyjams other resources as determined by grade level team Phet Simulations Other teacher resources
Assessment	<ul style="list-style-type: none"> Daily assignments Exit Tickets

- | | |
|--|---|
| | <ul style="list-style-type: none">• Individual and group projects• Formative assessments• Summative assessments |
|--|---|

Grade Level	4th
Subject	Science
Semester 2	Quarter 3 - Earth Science
Standards	<ul style="list-style-type: none"> • 4.ESS1: Earth's Place in the Universe <ul style="list-style-type: none"> ○ Generate and support a claim with evidence that over long periods of time, erosion (weathering and transportation) and deposition have changed landscapes and created new landforms. • 4.ESS2: Earth's Systems <ul style="list-style-type: none"> ○ Collect and analyze data from observations to provide evidence that rocks, soils, and sediments are broken into smaller pieces through mechanical weathering (frost wedging, abrasion, tree root wedging) and are transported by water, ice, wind, gravity, and vegetation. ○ <i>Interpret maps to determine that the location of mountain ranges, deep ocean trenches, volcanoes, and earthquakes occur in patterns.</i> ○ <i>Provide examples to support the claim that organisms affect the physical characteristics of their regions.</i> ○ <i>Analyze and interpret data on the four layers of the Earth, including thickness, composition, and physical states of these layers.</i> • 4.ESS3: Earth and Human Activity <ul style="list-style-type: none"> ○ <i>Obtain and combine information to describe that energy and fuels are derived from natural resources and that some energy and fuel sources are renewable (sunlight, wind, water) and some are not (fossil fuels, minerals).</i> ○ <i>Create an argument, using evidence from research, that human activity (farming, mining, building) can affect the land and ocean in positive and/or negative ways.</i> <p>Engineering, Technology, and Applications of Science (ETS) Standards are embedded throughout curriculum:</p> <ul style="list-style-type: none"> • 4.ETS1: Engineering Design <ul style="list-style-type: none"> ○ Categorize the effectiveness of design solutions by comparing them to specified criteria for constraints. • 4.ETS2: Links Among Engineering, Technology, Science, and Society <ul style="list-style-type: none"> ○ <i>Use appropriate tools and measurements to build a model.</i> ○ <i>Determine the effectiveness of multiple solutions to a design problem given the criteria and the constraints.</i> ○ <i>Explain how engineers have improved existing technologies to increase their benefits, to decrease known risks, and to meet societal demands (artificial limbs, seatbelts, cell phones).</i>
Objectives/I Can Statements	<ul style="list-style-type: none"> • I can describe Earth's internal layers: the crust, the mantle, and the outer and inner cores. • I can explain that Earth's crust is made of tectonic plates: large continent-size pieces that move on the planet. • I can model the layers of the Earth. • I can explain the processes of weathering, erosion, and deposition. • I can explain the causes of erosion. • I can relate the processes of weathering, erosion, and deposition to changes on Earth's surface. • I can make observations and measurements of the effects of weathering, erosion, and deposition. • I can summarize the definition of a landform. • I can use data from maps and other sources to categorize and compare landforms. • I can interpret causes and effects of the processes that create landforms.

	<ul style="list-style-type: none"> • I can explain how constructive and destructive processes that create landforms result in patterns of Earth's features. • I can explain the causes and effects of earthquakes. • I can relate earthquake activity to various changes on Earth's surface. • I can relate earthquake distribution to tectonic plates and their movement. • I can explain the relationship between earthquakes and tsunamis. • I can compare three types of fossil fuels. • I can summarize how fossil fuels are formed. • I can describe the positive and negative effects of fossil fuel use. • I can identify ways to conserve fossil fuels. • I can define <i>nonrenewable</i> resource. • I can compare renewable and nonrenewable resources. • I can categorize at least three renewable and nonrenewable resources. • I can summarize the importance of renewable resources in everyday life. • I can formulate at least three ways to conserve renewable resources. • I can use the appropriate tools for measurements to build a model. • I can determine the effectiveness of multiple solutions. • I can explain how engineers have improved existing technologies to increase their benefits, decrease risks, and meet demands of people who live in the community.
Topics	<ul style="list-style-type: none"> • Changing Earth: Structure of the Earth, Erosion and Deposition, Landforms, Earthquakes • Earth's Resources: Fossil Fuels, Value of Renewable Resources
Vocabulary	<ul style="list-style-type: none"> • earthquake, mantle, tectonic plate, continental drift, crust, surface, lava, model, planet, rock layer, continent, horizon, electromagnetic spectrum, volcano, mountain, rock cycle, structure, core, molten, earth materials, magma, tsunami, Earth • valley, sedimentary rock, erosion, hurricane, surface, glacier, sediment, landform, dune, geology, weathering (physical), soil, freeze, deposit, delta, interact, flood, water, river, matter, feature, canyon • coastal plain, volcanic dome, ocean, ridge, erosion, desert, tectonic plate, elevation, plateau, map, delta, seamount, stream, plain, fault, canyon • seismograph, seismic, geology, ocean, lithosphere, crust, repetition • natural gas, earth materials, fuel, resource, fossil, solar energy, nonrenewable, coal, burn, gas, fossil fuels, energy (physical), plant, carbon dioxide, power, natural resources, compress • recycle, resource, energy, sustainable, matter, renewable resource
Summary of Key Learning Events/Instruction	<ul style="list-style-type: none"> • Major geologic events that occur over eons or brief moments in time continually shape and reshape the surface of the Earth, resulting in continuous global change. • Compare geologic events responsible for the earth's major geological features. • Investigate how the Earth's geological features change as a result of erosion (weathering and transportation) and deposition. • Explain how fossil fuels are formed, used, and conserved. • Evaluate how some earth materials can be used to solve human problems and enhance the quality of life. • Use and discuss texts and other media around the following topics: <i>Earth's Structure, Erosion, Earthquakes, Fossil Fuels, Renewable Resources</i> • Conduct developmentally appropriate research and inquiry activities.
Instructional Materials/Resources	<ul style="list-style-type: none"> • Discovery Education Science Techbook Unit 5 (1-4) and Unit 6 • Trade books • www.brainpop.com • www.studyjams.scholastic.com/studyjams • other resources as determined by grade level team

	<ul style="list-style-type: none">• PHET Simulations• Teacher resources
Assessment	<ul style="list-style-type: none">• Daily assignments• Exit Tickets• Individual and group projects• Formative assessments• Summative assessments

Grade Level	4th
Subject	Science
Semester 2	Quarter 4 - Engineering, Technology, Science, and Society
Standards	<ul style="list-style-type: none"> • 4.ESS1: Earth's Place in the Universe <ul style="list-style-type: none"> ○ <i>Use a model to explain how the orbit of the Earth and sun cause observable patterns: a. day and night; b. changes in length and direction of shadows over a day.</i> <p>Engineering, Technology, and Applications of Science (ETS) Standards are embedded throughout curriculum:</p> <ul style="list-style-type: none"> • 4.ETS1: Engineering Design <ul style="list-style-type: none"> ○ <i>Categorize the effectiveness of design solutions by comparing them to specified criteria for constraints.</i> • 4.ETS2: Links Among Engineering, Technology, Science, and Society <ul style="list-style-type: none"> ○ <i>Use appropriate tools and measurements to build a model.</i> ○ <i>Determine the effectiveness of multiple solutions to a design problem given the criteria and the constraints.</i> ○ <i>Explain how engineers have improved existing technologies to increase their benefits, to decrease known risks, and to meet societal demands (artificial limbs, seatbelts, cell phones).</i>
Objectives/I Can Statements	<ul style="list-style-type: none"> • I can model the Earth's rotation on its axis and explain how it creates the cycle of day and night. • I can draw a simple diagram to explain that when it is daytime on one side of the Earth, it is nighttime on the other. • I can explain how Earth's rotation affects the way that we view the planets, Sun, and stars. • I can categorize the effectiveness of design solutions by comparing them to specified criteria for constraints. • I can use appropriate tools and measurements to build a model. • I can determine the effectiveness of multiple solutions to a design a problem given criteria and constraints. • I can explain how engineers have improved existing technologies to decrease known risks. • I can explain how engineers have improved existing technologies to increase benefits. • I can explain how engineers have improved existing technologies to meet society's demands.
Topics	<ul style="list-style-type: none"> • Day and Night • The Cycle of Day and Night • Technology • Tools for Technology, Inventions • Family Life
Vocabulary	<ul style="list-style-type: none"> • season, planet, axis, radiation, orbit, light, position, rotate, phase, revolve, energy (physical), cycle, sundial, period, sun • invention, engineering, Global Positioning System, solution
Summary of Key Learning Events/Instruction	<ul style="list-style-type: none"> • Earth's movement in the solar system is caused by predictable patterns. • Earth's rotation affects the cycle of day and night. • Some parts of Earth experience daytime when other parts of Earth experience nighttime. • Earth's rotation affects the way we view the planets, the Sun, and the stars around us. • Explain the causes of the cycle of day and night, and why the Sun, stars, and planets appear to move across the sky. • Use and discuss texts and other media around the following topics: <i>Day and Night, Revolution and Rotation, Technology</i>

	<ul style="list-style-type: none"> • Conduct developmentally appropriate research and inquiry activities.
Instructional Materials/Resources	<ul style="list-style-type: none"> • Discovery Education Science Techbook Unit 7 • Trade books • www.brainpop.com • www.studyjams.scholastic.com/studyjams • Michigan Model of Health • other resources as determined by the grade level team • Phet Simulations • NASA
Assessment	<ul style="list-style-type: none"> • Daily assignments • Exit Tickets • Individual and group projects • Formative assessments • Summative assessments