Bay Head School	
Content Area: Science **Course Title:** Science	**Grade Level:** Fourth Grade
Unit Plan 1 Energy	40 days
Unit Plan 2 Waves and their Applications in Technologies for Information Transfer	20 days
Unit Plan 3 From Molecules to Organisms: Structures and Processes	30 days
Unit Plan 4 Earth's Place in the Universe	20 days
Unit Plan 5 Earth's Systems	30 days
Unit Plan 6 Earth and Human Activity	30 days
Unit Plan 7 Engineering Design	10 days
Updated: October 2018 by Sharon Carroll Aligned to New Jersey Student Learning Standards	Board Approved:

Bay Head School
SCIENCE CURRICULUM
Unit Overview

Content Area: Science Unit 1 **Grade Level:** Fourth Grade

Domain (Unit Title): 4-PS3 Energy

Unit Summary: In this unit of study, fourth-grade students develop an understanding that energy can be transferred from place to place by sound, light, heat, and electrical currents. Students also obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment. The crosscutting *concepts of cause and effect, energy and matter,* and the *interdependence of science, engineering, and technology, and influence of science, engineering, and technology on society and the natural world* are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in *planning and carrying out investigations* and *obtaining, evaluating, and communicating information*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Primary Interdisciplinary Connections: Mathematics, Language Arts Literacy, Science, Social Studies. All of the NJ State Standards may be found on the New Jersey state website.

21 Century Themes:
All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world, as they relate to the individual, global society and the universe.

21st Century Life & Career Skills	All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.
Personal Financial Literacy	All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy.
Career Awareness, Exploration, and Preparation	All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the

	globally competitive work environment of the information age.
Career and Technical Education	All students who complete a career and technical education program will acquire academic and technical skills for careers in emerging and established professions that lead to technical skill proficiency, credentials, certificates, licenses, and/or degrees.

UNIT 1

Standards/Learning Targets

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 can be transferred from place to place by sound, light, heat, and electric currents. [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 motion energy of a vehicle, light, or sound; 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.]

Performance Expectation

Science and Engineering Practices	Disciplinary Core Ideas
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 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. (4- PS3-4)	**PS3.A: Definitions of Energy** ● The faster a given object is moving, the more energy it possesses. (4-PS3-1) ● Energy can be moved from place to place by moving objects or through sound, light, 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) ● Light also transfers energy from place to place. (4-PS3-2) ● Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or 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)

	● **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 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)

Crosscutting Concepts	**Learning Objectives**
Energy and Matter ● Energy can be transferred in various ways and between objects. (4-PS3-1),(4- PS3-2), (4-PS3-3), (4-PS3-4) **Influence of Science, Engineering and Technology on Society and the Natural World** ● Engineers improve existing technologies or develop new ones. (4-PS3-4) **Science is a Human Endeavor** ● Most scientists and engineers work in teams. (4-PS3-4) ● Science affects everyday life. (4-PS3-4)	Students will understand that… ● A wave is a pattern of motion that travels away from a source. ● Sound energy travels as a wave. The thing it travels through moves only a little. ● Materials are made of particles that are too small to see. ● Sound can travel through different kind of materials. ● Scientists make models to help them answer questions and visualize things that are difficult to see. ● Sound travels as a wave. The particles of the material it travels through move only a little. ● Sound travels as a series of collisions between particles. ● When particles collide they transfer energy, and that changes how they move. ● When sound waves have different amplitudes, we hear sounds with different volumes.

Bay Head School
SCIENCE CURRICULUM
Unit Overview

Content Area: Science Unit 2 **Grade Level:** Fourth Grade

Domain (Unit Title): 4-PS4 Waves and their Applications in Technologies for Information Transfer

Unit Summary: In this unit of study, students are able to use evidence to construct an explanation of the relationship between the speed of an object and the energy of that object, and are expected to develop an understanding that energy can be transferred from object to object through collisions. The crosscutting concept of *energy and matter* is called out as an organizing concept. Students are expected to demonstrate grade-appropriate proficiency in *asking questions, defining problems,* and *constructing explanations*, *and designing solutions*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

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UNIT 2
Standards/Learning Targets

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-PS4-2. 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-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.]

Performance Expectation

Science and Engineering Practices	Disciplinary Core Ideas
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) ● Develop a model to describe phenomena. (4-PS4-2) **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 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) **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.B: Electromagnetic Radiation** ● An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2) **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)

Crosscutting Concepts	**Learning Objectives**
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) **Cause and Effect** ● Cause and effect relationships are routinely identified. (4-PS4-2) **Interdependence of Science, Engineering, and Technology** ● Knowledge of relevant scientific concepts and research findings is important in engineering. (4-PS4-3)	Students will . . . ● A wave is a pattern of motion that travels away from a source. ● Sound energy travels as a wave. The thing it travels through moves only a little. ● Materials are made of particles that are too small to see. ● Sound can travel through different kind of materials. ● Scientists make models to help them answer questions and visualize things that are difficult to see. ● Sound travels as a wave. The particles of the material it travels through move only a little. ● Sound travels as a series of collisions between particles. ● When particles collide they transfer energy, and that changes how they move. ● When sound waves have different amplitudes, we hear sounds with different volumes. ● When sound waves have different wavelengths, we hear sounds with different pitches. ● Humans use patterns to communicate information and use technology to communicate those patterns across long distances.

Bay Head School
SCIENCE CURRICULUM
Unit Overview

Content Area: Science Unit 3 **Grade Level:** Fourth Grade

Domain (Unit Title): 4-LS1 From Molecules to Organisms: Structures and Processes

Unit Summary: In this unit of study, students are expected to develop an understanding that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. By developing a model, they describe that an object can be seen when light reflected from its surface enters the eye. The crosscutting concepts of *cause and effect, systems and system models,* and *structure and function* are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in *developing and using models*. Students are expected to use these practices to demonstrate understanding of the core ideas.

Primary Interdisciplinary Connections: Mathematics, Language Arts Literacy, Science, Social Studies. All of the NJ State Standards may be found on the New Jersey state website.

21 Century Themes:
All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world, as they relate to the individual, global society and the universe.

21st Century Life & Career Skills	All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.
Personal Financial Literacy	All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy.
Career Awareness, Exploration, and Preparation	All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

Career and Technical Education	All students who complete a career and technical education program will acquire academic and technical skills for careers in emerging and established professions that lead to technical skill proficiency, credentials, certificates, licenses, and/or degrees.

UNIT 3
Standards/Learning Targets

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.]

Performance Expectation

Science and Engineering Practices	**Disciplinary Core Ideas**
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 a model to test interactions concerning the functioning of a	**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**

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)	● 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)

Crosscutting Concepts	**Learning Objectives**
Systems and System Models ● A system can be described in terms of its components and their interactions. (4- LS1-1),(4-LS1-2)	Students will . . . ● Animals have different structures that allow them to get information from their environment. ● Sound and scent can carry information about the environment to an animal. ● Animals have different structures that allow them to get information from their environment, which helps them survive. ● Light, sound, and scent can carry information about the environment to an animal. ● Light needs to get to an object for an animal to see the object. ● Light needs to reflect off an object and get to the eye for an animal to see the object. ● When scientists change only one variable in an investigation, they can figure out if it makes a difference. ● Light receptors in the eye respond to light and send information to the brain. The brain processes this information to form an image. ● After forming an image, the brain compares the image to memories.

	Then an animal can make a decision that could help it survive. ● Different animals can have light receptors with different sensitivities. The brain cannot form a clear image if there is too much or too little light for the type of receptors an animal has.

Bay Head School
SCIENCE CURRICULUM
Unit Overview

Content Area: Science Unit 4 **Grade Level:** Fourth Grade

Domain (Unit Title): 4-ESS1 Earth's Place in the Universe

Unit Summary: In this unit of study, students apply their knowledge of natural Earth processes to generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. In order to describe patterns of Earth's features, students analyze and interpret data from maps. The crosscutting concepts of *patterns*, *cause and effect*, and the influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in planning and carrying out investigations, analyzing and interpreting data, and constructing explanations and designing solutions. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Primary Interdisciplinary Connections: Mathematics, Language Arts Literacy, Science, Social Studies. All of the NJ State Standards may be found on the New Jersey state website.

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	collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.
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Career Awareness, Exploration, and Preparation	All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.
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UNIT 4
Standards/Learning Targets

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; 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.]

Performance Expectation

Science and Engineering Practices	Disciplinary Core Ideas
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. ● Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	**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)

Crosscutting Concepts	Learning Objectives
Patterns ● Patterns can be used as evidence to support an explanation. (4-ESS1-1)	Students will understand that …. ● A fossil forms when an organism dies and is covered with sediment that turns into rock. ● A sedimentary rock layer forms when sediment sinks and builds up in water, compacts under more sediment, and cements over time. ● Over time, a rock layer becomes thicker as sediment continues to build up. ● Geologists use observations of and ideas about rocks and fossils to make inferences about past environments. ● Different sediments build up in different environments. Therefore, different kinds of sedimentary rock form in different environments. ● Different sedimentary rock layers in a place mean that the environment in that place has changed.

	• New rock layers form on top of existing rock layers. Therefore, lower rock layers are older than the layers above them. • Geologists observe the order of rock layers to infer the order of past environments. • Rock can be broken down and eroded by things in the environment, such as wind, water, plants, and ice. • The speed of water and amount of time it flows affect how much rock it erodes.

Bay Head School
SCIENCE CURRICULUM
Unit Overview

Content Area: Science Unit 5 **Grade Level:** Fourth Grade

Domain (Unit Title): 4-ESS2 Earth's Systems

Unit Summary: In this unit of study, students apply their knowledge of natural Earth processes to generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. In order to describe patterns of Earth's features, students analyze and interpret data from maps. The crosscutting concepts of *patterns*, *cause and effect*, and the influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in planning and carrying out investigations, analyzing and interpreting data, and constructing explanations and designing solutions. Students are also expected to use these practices to demonstrate understanding of the core ideas.

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UNIT 5
Standards/Learning Targets

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, 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.]

Performance Expectation

Science and Engineering Practices	Disciplinary Core Ideas
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)	**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 land and water features areas of Earth. (4-ESS2-2) **ESS2.E: Biogeology** ● Living things affect the physical characteristics of their regions. (4-ESS2-1)

Crosscutting Concepts	Learning Objectives
Patterns	Students will understand that ….

• Patterns can be used as evidence to support an explanation. (4-ESS2-2) **Cause and Effect** • Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1)	• A fossil forms when an organism dies and is covered with sediment that turns into rock. • A sedimentary rock layer forms when sediment sinks and builds up in water, compacts under more sediment, and cements over time. • Over time, a rock layer becomes thicker as sediment continues to build up. • Geologists use observations of and ideas about rocks and fossils to make inferences about past environments. • Different sediments build up in different environments. Therefore, different kinds of sedimentary rock form in different environments. • Different sedimentary rock layers in a place mean that the environment in that place has changed. • New rock layers form on top of existing rock layers. Therefore, lower rock layers are older than the layers above them. • Geologists observe the order of rock layers to infer the order of past environments. • Rock can be broken down and eroded by things in the environment, such as wind, water, plants, and ice. • The speed of water and amount of time it flows affect how much rock it erodes.

Bay Head School
SCIENCE CURRICULUM
Unit Overview

Content Area: Science Unit 6 **Grade Level:** Fourth Grade

Domain (Unit Title): 4-ESS3 Earth and Human Activity

Unit Summary: In this unit of study, students develop understandings of the effects of weathering and the rate of erosion by water, ice, wind, or vegetation. The crosscutting concepts of *pattern*s and *cause and effect* are called out as organizing concepts. Students demonstrate grade-appropriate proficiency in *planning and carrying out investigations* and *constructing explanations*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

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UNIT 6
Standards/Learning Targets

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 energy, 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.]

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.] [Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.]

Performance Expectation

Science and Engineering Practices	Disciplinary Core Ideas
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-ESS3-2) **Obtaining, Evaluating, and Communicating Information** Obtaining, evaluating, and communicating	**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) **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**

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)	● Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)

Crosscutting Concepts	**Learning Objectives**
Cause and Effect ● Cause and effect relationships are routinely identified and used to explain change. (4-ESS3-1) ● Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS3-2) **Interdependence of Science, Engineering, and Technology** ● Knowledge of relevant scientific concepts and research findings is important in engineering. (4-ESS3-1) **Influence of Science, Engineering and Technology 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) ● Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands. (4-ESS3-2)	Students will understand that… ● A fossil forms when an organism dies and is covered with sediment that turns into rock. ● A sedimentary rock layer forms when sediment sinks and builds up in water, compacts under more sediment, and cements over time. ● Over time, a rock layer becomes thicker as sediment continues to build up. ● Geologists use observations of and ideas about rocks and fossils to make inferences about past environments. ● Different sediments build up in different environments. Therefore, different kinds of sedimentary rock form in different environments. ● Different sedimentary rock layers in a place mean that the environment in that place has changed. ● New rock layers form on top of existing rock layers. Therefore, lower rock layers are older than the layers above them. ● Geologists observe the order of rock layers to infer the order of past environments. ● Rock can be broken down and eroded by things in the environment, such as wind, water, plants, and ice.

	• The speed of water and amount of time it flows affect how much rock it erodes.

Bay Head School
SCIENCE CURRICULUM
Unit Overview

Content Area: Science Unit 7 **Grade Level:** Fourth Grade

Domain (Unit Title): 3-5 ETS1 Engineering Design

Primary Interdisciplinary Connections: Mathematics, Language Arts Literacy, Science, Social Studies. All of the NJ State Standards may be found on the New Jersey state website.

21 Century Themes:
All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world, as they relate to the individual, global society and the universe.

21st Century Life & Career Skills	All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.
Personal Financial Literacy	All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy.
Career Awareness, Exploration, and Preparation	All students will apply knowledge about

	and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.
Career and Technical Education	All students who complete a career and technical education program will acquire academic and technical skills for careers in emerging and established professions that lead to technical skill proficiency, credentials, certificates, licenses, and/or degrees.

UNIT 1
Standards/Learning Targets

3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Performance Expectation

Science and Engineering Practices	**Disciplinary Core Ideas**
Asking Questions and Defining Problems Asking questions and defining problems in 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships. ● Define a simple design problem that	**ETS1.A: Defining and Delimiting Engineering Problems** ● Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined

can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. (3-5-ETS1-1) **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. ● 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. (3-5-ETS1-3) **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 problem. (3-5-ETS1-2)	by considering the desired features 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. (3-5-ETS1-1) **ETS1.B: Developing Possible Solutions** ● Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2) ● At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2) ● Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3) **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. (3-5-ETS1-3)

Crosscutting Concepts	**Learning Objectives**
Influence of Engineering, Technology, and Science on Society and the Natural World ● People's needs and wants change over time, as do their demands for	Students will understand that … ● A situation that people want to change or create can be approached as a problem to be solved through engineering.

new and improved technologies. (3-5-ETS1-1) • Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2	• Asking questions, making observations, and gathering information are helpful in thinking about problems. • The shape and stability of structures of natural and designed objects are related to their function(s)

Suggested Accommodation For All Units

Special Education/504 Plans/Students with Disabilities:

- Follow specific IEP/504 accommodations and modifications
- Extended time
- Modified assignments
- Labeled pictures of weather phenomenon
- Pre-teach concepts
- Differentiate assignments

Gifted and Talented:

- Differentiate assignments
- Higher level texts
- Homework questions should be open ended to increase higher level thinking
- Differentiate test questions
- Create alternate projects or assignments that challenge thinking
- Reference and possibly apply assessment boundary skills

Students at Risk of Failure:

- Small group instruction
- Frequent breaks
- Model how assignments should look
- Incorporate social/emotional discussions
- Encourage and monitor positive peer collaboration
- Provide academic resources for both school and home use

Economically Disadvantaged:

- Structure the learning around explaining or solving a social or community-based issue.
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).

Culturally Diverse:

- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).