

SCHOOL DISTRICT OF THE CHATHAMS

Science Grade 4 Full Year

Course Overview

Students are able to use a model of waves to describe patterns of waves in terms of amplitude and wavelength, and that waves can cause objects to move. Students are expected to develop understanding of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. They apply their knowledge of natural Earth processes to generate and compare multiple solutions to reduce the impacts of such processes on humans. In order to describe patterns of Earth's features, students analyze and interpret data from maps. Fourth graders 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. 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. Students are expected to develop an understanding that energy can be transferred from place to place by sound, light, heat, and electric currents or from object to object through collisions. They apply their understanding of energy to design, test, and refine a device that converts energy from one form to another. The crosscutting concepts of patterns; cause and effect; energy and matter; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the fourth grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

New Jersey Student Learning Standards

The New Jersey Student Learning Standards (NJSLS) can be located at www.nj.gov/education/cccs/2020/.

Physical Science

- 4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object.
- 4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- 4-PS3-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide.
- 4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

Life Science

- 4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

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.

Earth & Space Sciences

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.

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.

4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features

4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.*

Engineering, Technology & Applications of Science

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.

Technology Standards

9.4.5.IML.2: Create a visual representation to organize information about a problem or issue (e.g., 4.MD.B.4, 8.1.5.DA.3).

9.4.5.IML.3: Represent the same data in multiple visual formats in order to tell a story about the data

9.4.5.TL.2: Sort and filter data in a spreadsheet to analyze findings.

9.4.5.TL.3: Format a document using a word processing application to enhance text, change page formatting, and include appropriate images, graphics, or symbols.

4.2.IML.2: Represent data in a visual format to tell a story about the data

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9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.

Career Ready Practices

CRP4. Communicate clearly and effectively and with reason.

CRP5. Consider the environmental, social and economic impacts of decisions.

CRP7. Employ valid and reliable research strategies.

CRP11. Use technology to enhance productivity.

Interdisciplinary Connections

English Language Arts:

Reading:

- RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
- RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

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- RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.
- RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.

Writing:

- W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information.
- W.4.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
- W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.
- W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.
- W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

Speaking and Listening:

- SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.

Mathematics:

- 4.MD.A.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.
- 4.MD.A.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.
- 4.OA.A.1 Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.
- 4.OA.A.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
- 4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
- 4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line symmetric figures and draw lines of symmetry.

Units of Study

Unit 1: Energy (~40 days)

- How does energy move?

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- How is energy and fuel derived from natural resources?
- In what ways does the human use of natural resources affect the environment?
- How is the speed of an object and its energy related?
- How does energy change when objects collide?
- How can scientific ideas be applied to design, test, and refine a device that converts energy from one form to another?

Unit 2: Earth Systems (~30 days)

- How can maps tell us about the features of the world?
- How can the impacts of natural Earth processes on humans be reduced?
- How does weathering or the rate of erosion affect Earth's materials?
- How can we predict where earthquakes and volcanic eruptions occur?

Unit 3: Waves (~20 days)

- How can waves be used to communicate?
- How are waves used to transfer energy and information?
- How is light important when observing an object?
- How are instruments that transmit and detect waves used to extend human senses?

Unit 4: Structure, Function and Information Processes (~30 days)

- How do internal and external parts of plants and animals help them to survive, grow, behave, and reproduce?
- How do animals receive, process and respond to information from their senses?

<h3>Learning Objectives/Discipline Standards of Practice</h3>

Learning Objectives:

Physical Science

- Energy can be transferred from place to place by sound, light, heat, and electric currents.
- Energy and fuels that humans use are derived from natural sources.
- Energy can be renewable including wind energy, water behind dams, and sunlight.
- Energy can be nonrenewable energy including fossil fuels, fissile materials
- Examples of environmental effects could include:
 - Loss of habitat due to dams
 - Loss of habitat due to surface mining
- The use of energy and fuels from natural sources affects the environment in multiple ways, for example loss of habitat due to dams or loss of habitat due to surface mining
- The faster a given object is moving, the more energy it possesses.
- 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.
- 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
- Waves can cause an object to move.
- Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks)
- Objects can be seen only if light follows a path between a light source, the object, and the eye.
- Knowledge of digitized information transfer

Life Science

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- Different structures work together as part of a system to support survival, growth, behavior, and/or reproduction
- Internal and external structures serve specific functions within plants and animals
- Sense receptors send information about the surroundings to the brain.
- Information that is transmitted to the brain by sense receptors can be processed immediately as perception of the environment and/or stored as memories.
- Immediate perceptions or memories processed by the brain influence an animal's action or responses to features in the environment.
- Sensory input, the brain, and behavioral output are all parts of a system that allow animals to engage in appropriate behaviors.

Earth Science

- Specific rock layers in the same location show specific fossil patterns
- Irregularities in the patterns of rock layers indicate disruptions due to Earth forces
- The change in the shape of Earth materials as the result of weathering or the rate of erosion is caused by the motion of water, ice, wind or vegetation.
- Volcanoes and earthquakes occur in bands that are often along the boundaries between continents and oceans.
- Major mountain chains form inside continents or near their edges.

Discipline Standards of Practice:

Science and Engineering Practices

- Plan and Carryout and Investigation
- Asking Questions and Defining Problems
- Analyzing and Interpreting Data
- Constructing Explanations and Designing Solutions
- Obtaining, Evaluating, and Communicating Information
- Engaging In Argument From Evidence
- Developing and Using Models

Crosscutting Concepts

- Patterns
- Cause and Effect
- Interdependence of Science, Engineering, and Technology
- Influence of Engineering, Technology, and Science on Society and the Natural World
- System and System Models
- Scale, Proportion and Quantity
- Scientific Knowledge Assumes an Order and Consistency in Natural Systems
- Influence of Engineering, Technology, and Science on Society and the Natural World
- Connections to Nature of Science
- Science is a Human Endeavor

Instructional Resources and Materials

Whole class resources have been identified with an asterisk.

Resources

- Discovery Education
- Generation Genius

Materials

- Science Notebook

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- Chromebook

Assessment Strategies

Assessment is designed to measure a student's mastery of a course standard and learning objective. Assessment can be used for both instructional purposes (formative assessment) and for evaluative purposes (summative assessment).

The following is a general list of the many forms assessment may take in learning.

- Science Journals
- Investigations
- Class discussions
- Claim, Evidence Reasoning Writing