

4th Grade - Physical Science - Energy

Content Area: **Science**
Course(s):
Time Period: **Marking Period 1**
Length: **12 weeks**
Status: **Published**

Course Pacing Guide

Unit	MP/Trimester	Weeks
Investigation 1 - Energy and Circuits	1,2,or 3 (teacher rotate)	3 weeks
Investigation 2 - The Force of Magnetism	1,2,or 3 (teacher rotate)	3 weeks
Investigation 3 - Electromagnets	1,2,or 3 (teacher rotate)	3 weeks
Investigation 4 - Energy Transfer	1,2,or 3 (teacher rotate)	3 weeks
Investigation 5 - Waves	1,2,or 3 (teacher rotate)	3 weeks

Unit Overview

The Energy Module provides first-hand experiences in physical science dealing with energy and change.

Enduring Understandings

- Magnets interact with each other and with materials that contain iron.
- Like poles of magnets repel each other; opposite poles attract. The magnetic force declines as the distance between the magnets increases.
- Conductors are materials through which electric current can flow; all metals are conductors.
- Any change of motion requires a force.
- Gravity is a pulling force that acts between all masses.
- Energy is present whenever there is motion, electric current, sound, light, or heat.

- Electricity (electric current) transfers energy that can produce heat, light, sound, and motion. Electricity can be produced from a variety of sources.
- A circuit is a system that includes a complete pathway through which electric current flows from a source of energy to its components.
- Energy can be generated by burning fossil fuels or harnessing renewable energy sources such as solar, wind, hydroelectric, and geothermal.
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Essential Questions

What is needed to light a bulb?

What is needed to make a complete pathway for current to flow in a circuit?

How can you light two bulbs brightly with one D-cell?

Which design is better for manufacturing long strings of lights-series or parallel?

What materials stick to magnets?

What happens when two or more magnets interact?

What happens when a piece of iron comes close to or touches a permanent magnet?

What happens to the force of attraction between two magnets as the distance between them changes?

How can you turn a steel rivet into a magnet that turns on and off?

What happens to the force of attraction between two magnets as the distance between them changes?

How does the starting position affect the speed of a ball rolling down a ramp?

What happens when objects collide?

How are waves involved in energy transfer?

How does light travel?

How can you make a motor run faster with solar cells

New Jersey Student Learning Standards (No CCS)

SCI.4	Structure, Function, and Information Processing
SCI.4	Waves: Waves and Information
SCI.4	Energy
SCI.4-ESS3-1	Obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment.
SCI.4-LS1-1	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
SCI.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.
SCI.4-PS3-4	Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
SCI.4-PS3-3	Ask questions and predict outcomes about the changes in energy that occur when objects collide.
SCI.4-PS3-1	Use evidence to construct an explanation relating the speed of an object to the energy of that object.
SCI.4-PS3-2	Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
SCI.4-PS4-3	Generate and compare multiple solutions that use patterns to transfer information.
SCI.4-PS4-2	Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
SCI.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.

Interdisciplinary Connections

List at least one specific standard

No general statements

MA.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.
LA.RI.4.1	Refer to details and examples in a text and make relevant connections when explaining

what the text says explicitly and when drawing inferences from the text.

LA.RI.4.2	Determine the main idea of a text and explain how it is supported by key details; summarize the text.
LA.RI.4.4	Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area.
LA.RI.4.5	Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in a text or part of a text.
LA.RI.4.6	Compare and contrast a firsthand and secondhand account of the same event or topic; describe the differences in focus and the information provided.
LA.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.
LA.RI.4.8	Explain how an author uses reasons and evidence to support particular points in a text.
LA.RI.4.9	Integrate and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) information from two texts on the same topic in order to write or speak about the subject knowledgeably.
LA.RI.4.10	By the end of year, read and comprehend literary nonfiction at grade level text-complexity or above, with scaffolding as needed.
LA.RF.4.3	Know and apply grade-level phonics and word analysis skills in decoding and encoding words.
LA.RF.4.4	Read with sufficient accuracy and fluency to support comprehension.
LA.W.4.2	Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
LA.W.4.5	With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing.
LA.W.4.7	Conduct short research projects that build knowledge through investigation of different aspects of a topic.
LA.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.
MA.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.
LA.W.4.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
LA.SL.4.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 4 topics and texts, building on others' ideas and expressing their own clearly.
LA.SL.4.2	Paraphrase portions of a text read aloud or information presented in diverse media and formats (e.g., visually, quantitatively, and orally).
LA.SL.4.4	Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.
LA.SL.4.5	Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.
LA.L.4.3	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
LA.L.4.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 4 reading and content, choosing flexibly from a range of strategies.

LA.L.4.4.C	Consult reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation and determine or clarify the precise meaning of key words and phrases.
LA.L.4.6	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal precise actions, emotions, or states of being (e.g., quizzed, whined, stammered) and that are basic to a particular topic (e.g., wildlife, conservation, and endangered when discussing animal preservation).

Technology Standards

List specific standards that are relevant

No general statements

21st Century Themes/Careers

Digital media will be used incorporated in project presentations. This module will develop students' abilities to do and understand scientific inquiry. Students will identify questions, design and conduct scientific investigations to answer those questions, employ tools to gather, analyze, and interpret data. They will use data to construct reasonable explanations, develop and communicate investigations and evidence and understand that scientists use different kinds of investigations and tools to develop explanations using evidence and knowledge. This module will develop and extend students' understandings about science and technology. Students will work collaboratively in teams and use tools and scientific techniques to make better observations.

Instructional Strategies & Learning Activities

- Establish prior knowledge
- Present new material in small steps
- Think Aloud/modeling
- Guided Practice
- State the objective
- Use graphic organizers/anchor charts
- Concept sorting
- Check for understanding
- Provide feedback
- Student-led discussion strategies
- Cooperative learning
- Tiered instructional activities
- Differentiation
- Small group instruction

Differentiated Instruction

- Curriculum Map
- Inquiry/Problem-Based Learning
- Learning preferences integration (visual, auditory, kinesthetic)
- Sentence & Discussion Stems
- Tiered Learning Targets
- Learning through play
- Relationship-Building & Team-Building
- Student Data Inventories
- Mastery Learning (feedback toward goal)
- Game-Based Learning
- Grouping
- Rubrics
- Jigsaws
- Learning Through Workstations
- Concept Attainment
- Flipped Classroom
- Assessment Design & Backwards Planning
- Student Interest & Inventory Data
- i-Checks as provided by FOSS curriculum
- EL Notes as outlined in FOSS Teacher Manual

Formative Assessments

- Notebook Entries
- Revisions to Written Responses to Focus Questions

Summative Assessment

- Written Responses to Focus Questions per Investigation/Part
- Performance Assessments

Benchmark Assessments

- Investigation I-Checks
- Surveys

Resources & Technology

The following resources are available on the Teacher Module on the FOSS webpage.

- Word Wall Cards
- Streaming Videos
- Teaching Slides (Smart Notebook, ActivInspire, etc.)
- List of Recommended Books
- List of Recommended Websites
- Online Activities: Virtual Terrarium, Virtual Aquarium, Food Webs, Trout Range of Tolerance, and Analyzing Environmental Experiments

BOE Approved Texts

- FOSS Soils, Rocks, and Landforms Investigations Guide - Teacher Manual
- FOSS Soils, Rocks, and Landforms - Student Textbook

Closure

- Snowstorm - Students write down what they learned on a piece of scratch paper and wad it up. Given a signal, they throw their paper snowballs in the air. Then each learner picks up a nearby response and reads it aloud.
- Gallery Walk - On chart paper, small groups of students write and draw what they learned. After the completed works are attached to the classroom walls, others students affix post-its to the posters to extend on the ideas, add questions.
- Sequence It - create timelines of major events discussed
- Low-Stakes Quizzes - Give a short quiz using technologies like Kahoot or a Google form.
- Have students write down three quiz questions (to ask at the beginning of the next class).
- Question Stems - Have students write questions about the lesson on cards, using [question stems framed around Bloom's Taxonomy](#). Have students exchange cards and answer the question they have acquired.
- Have students dramatize a real-life application of a skill.
- Ask a question. Give students ten seconds to confer with peers before you call on a random student to answer. Repeat.
- Have kids orally describe a concept, procedure, or skill in terms so simple that a child in first grade would get it.
- Direct kids to raise their hands if they can answer your questions. Classmates agree (thumbs up) or disagree (thumbs down) with the response.
- Kids write notes to peers describing what they learned from them during class discussions.
- Ask students to summarize the main idea in under 60 seconds to another student acting as a well-known personality who works in your discipline. After summarizing, students should identify why the famous person might find the idea significant.
- Ask students to write what they learned, and any lingering questions on an "exit ticket". Before they leave class, have them put their exit tickets in a folder or bin labeled either "Got It," "More Practice,

Please," or "I Need Some Help!"

ELL

Such as:

- Alternate Responses
- Advance Notes
- Extended Time
- Teacher Modeling
- Simplified Written and Verbal Instructions
- Frequent Breaks
- E-Dictionaries
- Google Translate

Special Education

- Shorten assignments to focus on mastery of key concepts.
- Substitute alternatives for written assignments (clay models, posters, panoramas, collections, etc.)
- Specify and list exactly what the student will need to learn to pass.
- Provide a computer for written work.
- Seat the student close to the teacher or a positive role model.
- Provide an unobstructed view of the chalkboard, teacher, movie screen, etc.
- Keep extra supplies of classroom materials (pencils, books) on hand.
- Give directions in small steps and in as few words as possible.
- Number and sequence the steps in a task.
- Have student repeat the directions for a task.
- Provide visual aids.
- Go over directions orally.
- Provide a vocabulary list with definitions.
- Permit as much time as needed to answer Focus Questions.
- Have text material read to the student, and allow oral responses.
- Allow use of notes and textbooks to answer Focus Questions.
- Show a model of the end product of directions (e.g., a completed math problem or finished quiz).
- Stand near the student when giving directions or presenting a lesson.
- Permit a student to revise written responses for a better grade.
- Provide graphic organizers to record data throughout investigations and experiments.
- Provide sentence starters to organize written responses to Focus Questions.
- Highlight lines to assist student penmanship and line spacing.

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- verbal testing
- occupational or physical therapy

At Risk

- Use of mnemonics
- Have student restate information
- Provision of notes or outlines
- Concrete examples
- Peer or scribe note-taking
- Lab and math sheets with highlighted instructions
- Verbal and visual cues regarding directions and staying on task
- Adjusted assignment timelines
- Immediate feedback
- Work-in-progress check
- Pace long-term projects
- Film or video supplements in place of reading text
- Cue/model expected behavior

Gifted and Talented

Focus on effort and practice

Offer the Most Difficult First

Offer choice

Speak to Student Interests

Allow G/T students to work together

Encourage risk taking

