Unit 1: Energy Unit

Content Area: **Science**
Course(s): **Science**
Time Period: **Marking Period 1**
Length: **10 Weeks**
Status: **Published**

Unit Overview

In this unit, students will deal with energy and change. Students investigate electricity and magnetism as related effects and engage in engineering design while learning useful applications of electromagnetism in everyday life. They explore energy transfer through waves, repeating patterns of motion, that result in sound and motion. The investigations focus on the concepts that energy is present whenever there is motion, electric current, sound, light, or heat, and that energy can transfer from one place to another.

Standards

Disciplinary Core Ideas (DCI's)

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.
3-PS2-3	Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
4-PS3-4	Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
3-PS2-4	Define a simple design problem that can be solved by applying scientific ideas about magnets.
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.
4-PS4-2	Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
4-PS4-3	Generate and compare multiple solutions that use patterns to transfer information.

Crosscutting Concepts (CC's)

CCC.1.1	students identify similarities and differences in order to sort and classify natural objects and designed products. They identify patterns related to time, including simple rates of change and cycles, and to use these patterns to make predictions.

CCC.2.1	students routinely identify and test causal relationships and use these relationships to explain change. They understand events that occur together with regularity might or might not signify a cause and effect relationship.
CCC.4.1	students understand that a system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. They can also describe a system in terms of its components and their interactions.
SCI.3-5.1.2	Patterns of change can be used to make predictions.
SCI.3-5.1.3	Patterns can be used as evidence to support an explanation.
SCI.3-5.4.2	A system can be described in terms of its components and their interactions.
SCI.3-5.5.3	Energy can be transferred in various ways and between objects.

Science and Engineering Practices (SEP's)

SEP.1.a	Ask questions about what would happen if a variable is changed.
SEP.1.c	Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.
SEP.2.c	Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.
SEP.2.d	Develop and/or use models to describe and/or predict phenomena.
SEP.2.f	Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.
SEP.3.a	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.
SEP.3.c	Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.
SEP.3.d	Make predictions about what would happen if a variable changes.
SEP.4.a	Represent data in tables and/or various graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.
SEP.4.b	Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation.
SEP.4.c	Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.
SEP.4.d	Analyze data to refine a problem statement or the design of a proposed object, tool, or process.
SEP.4.e	Use data to evaluate and refine design solutions.
SEP.5.b	Organize simple data sets to reveal patterns that suggest relationships.
SEP.6.b	Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem.
SEP.6.c	Identify the evidence that supports particular points in an explanation.
SEP.6.d	Apply scientific ideas to solve design problems.
SEP.6.e	Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.
SEP.7.d	Construct and/or support an argument with evidence, data, and/or a model.

SEP.7.e	Use data to evaluate claims about cause and effect.
SEP.7.f	Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.
SEP.8.a	Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence.
SEP.8.b	Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices.
SEP.8.d	Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.
SEP.8.e	Communicate scientific and/or technical information orally and/or in written formats, including various forms of media as well as tables, diagrams, and charts.

Essential Questions

Investigation 1- Energy and Circuits

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 briightly with one D-cell?

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

Investigation 2- The Force of Magnetism

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?

Investigation 3- Electromagnets

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

How does the number of winds of wire around a core affect the strength of the magnetism?

How can you reinvent the telegraph using your knowledge of energy and electromagnetism?

Investigation 4- Energy Transfer

What do we observe that provides evidence that energy is present?

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

What happens when objects collide?

Investigation 5- Waves

How are waves involved in energy transfer?

How does light travel?

How can you make a motor run faster using solar cells?

Application of Knowledge: Students will know that…

- a magnetic field surrounds a wire through which electric current is flowing.
- a telegraph system is an electromagnet-based technology used for long-distance communication.
- all magnets have two poles, a north pole at one end (side) and a south pole at the other end (side). Like poles of magnets repel each other, and opposite poles attract.
- an electric current is a system that includes a complete pathway through which electric current flows from an energy source to its components.
- an electromagnet is made by sending electric current through an insulated wire wrapped around an iron core.
- an object is seen only when light from that object enters and is detected by an eye.
- conductors are materials through which electric current can flow; all metals are conductors.
- Earth has a magnetic field.
- energy is evident whenever there is motion, electric current, sound, light, or heat. Energy can be transferred from place to place.
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- in a series circuit, there is a single pathway from the energy source to the components; in a parallel circuit, each component has its own direct pathway to the energy source.
- kinetic energy is energy of motion; potential energy is energy of position. For identical objects at rest, the objects at higher heights have more potential energy than the objects at lower heights.
- light can refract (change direction) when it passes from one transparent material into another.

- light travels in straight lines and can reflect (bounce) off surfaces.
- magnets are surrounded by an invisible magnetic field, which acts through space and through most materials.
- magnets interact with each other and with some materials.
- magnets stick to (attract) objects that contain iron. Iron is the only common metal that sticks to magnets.
- matter can absorb light.
- objects in motion have energy. The faster a given object is moving, the more kinetic energy it has.
- solar cells are designed technologies to transfer visible light into electricity.
- the amount of electric currents flowing in an electromagnet circuit affects the strength of the magnetism in the core (more current=stronger magnetism).
- the energy is of two energy sources (D-cells or solar cells) adds when they are wired in a series, delivering more power than a single source.
- the energy of two energy sources (D-cells or solar cells) adds when they are wired in series, delivering more power than a single source. Two cells in parallel have the same power as a single cell.
- the magnetic field produced by a current-carrying wire can induce magnetism in a piece of iron or steel.
- the magnetic force acting between magnets declines as the distance between them increases.
- the number of winds wire in an electromagnet coil affects the strength of the magnetism induced in the core (more winds=more magnetism).
- there are sound waves, light waves, radio waves, microwaves, and ocean waves.
- two cells in parallel have the same power as a single cell.
- waves are a repeating pattern of motion that transfer energy from place to place. Some electromagnetic waves can be detected by humans (light); others can be detected by designed technologies (radio waves, cell phones).
- waves have properties- amplitude, wave length, and frequency.
- when an iron object enters a magnetic field, the field induces magnetism in the iron object, and the object becomes a temporary magnet.
- when objects collide, energy can transfer from one object to another, thereby changing their motion.
- white light is a mixture of all colors (wavelengths) of visible light.

Application of Skills: Students will be able to...

- analyze compression waves (sound waves) to learn the general properties of waves- amplitude, wavelength, and frequency.
- apply their knowledge of circuitry and electromagnetism to build a telegraph.
- conduct structured investigations to discover how the variables of starting position on the ramp and ball size (mass) affect the speed of a rolling ball.
- connect two bulbs in a way that allows both to shine brightly using two cells or a single D-cell.
- design series and parallel solar cell circuits and observe the effect on the speed of a motor.
- determine which materials can complete the pathway (conductors) and which cannot (insulators) by using a circuit and a collection of objects.
- devise a series circuit to operate two bulbs with one D-cell.

- discover that a steel core becomes a magnet when current flows through an insulated wire wound around the steel core.
- discover that bringing a magnet close to a piece of iron includes magnetism in the iron.
- discover that iron-containing objects stick to permanent magnets; other objects do not.
- experience waves through firsthand experiences using ropes, demonstrations with waves in water, spring toys, and a sound generator.
- experiment to find out how the number of winds of wire affect the strength of magnetism.
- explore evidence of energy when sound, heat, and light are produced, and when objects are in motion.
- find out where to wind the wire on the core to produce the strongest magnet.
- find ways to operate more than one lightbulb in a circuit.
- generate a rule for magnetic interaction with materials: if a magnet sticks to an object, that object is most likely made of iron or its alloy steel.
- invent a code and use their telegraphs to send messages to each other.
- investigate which type of circuit would be the best design for a string of lights.
- know that waves are repeating patterns of motion that transfer energy from place to place.
- learn that the force of attraction between magnets decreases as the distance between them increases.
- make a circuit that they can turn on and off using a switch and motor.
- make a complete circuit using a D-cell, wires, and a lightbulb.
- observe that cells in series make the motor run faster, but cells in parallel do not deliver additional power to the motor.
- observe that the two sides (poles) of magnets are different, attracting or repelling one another, depending on orientation.
- place an obstacle (cork) in the pathway of a steel ball rolling down a ramp, forcing them to collide.
- roll steel balls of different sizes down ramps and explore the system's variables.
- use a balance to measure the force of attraction between magnets.
- use mirrors to experience reflecting light.
- wire two bulbs in parallel and find out that many bulbs can be made to shine brightly on a single D-cell when they are wired in parallel.
- work with magnets and other objects to discover that magnetism acts through air, most metals, and all nonmetals.

Assessments

Pre-Assessment/Survey

Investigation 1 - Energy and Circuits:

- Formative Assessments: Science Notebook entry, Response Sheet and Performance Assessment
- Benchmark Assessments: Survey, Investigation 1 I-Check

Investigation 2 - The Force of Magnetism:

- Formative Assessments: Science Notebook entry, Response Sheet, and Performance Assessment
- Benchmark Assessments: Investigation 2 I-Check

Investigation 3 - Electromagnets:

- Formative Assessments: Science Notebook entries, Response Sheet and Performance Assessment
- Benchmark Assessments: Investigation 3 I-Check

Investigation 4 - Energy Transfer:

- Formative Assessments: Response Sheet, Science Notebook entries, Performance Assessment
- Benchmark Assessments: Investigation 4 I-Check

Investigation 5 - Waves:

- Formative Assessments: Science Notebook entry, Response Sheet, and Performance Assesment
- Benchmark Assessments: Posttest

Suggested Activities

Investigation 1

- Part 1- Lighting a Bulb
    - Activate prior knowledge about energy
    - Introduce the flashlight and the lightbulb
    - Set up notebooks
    - Introduce system and electricity
    - Introduce notebook sheet 1
    - Introduce circuit vocabulary
    - Study the bulb filament
    - Start a class energy systems chart
    - View online activities
    - Science Resource Book "Edison Sees the Light"
- Part 2- Conductors and Circuits
    - Introduce and investigate motors
    - Reinforce the concept of a circuit
    - Give the switch challenge and explore switches
    - Add to the energy chart
    - Design a test system and the test a nail and straw
    - Introduce conductor and insulator
    - Sort conductors and insulators
    - Discuss the foils
    - Bag the test objects
    - Make a conductor detector and search for conductors
    - View online activities
    - Science Resource Book "Energy Sources"

- Part 3- Series and Parallel Circuits
    - Introduce the two-bulb challenge, draw two-bulb circuits, and set up two-bulb circuits
    - Introduce series circuits
    - Discuss explanations for dim lights and begin to solve the dim-light problems
    - Compare two cells in series
    - Introduce parallel circuits and draw parallel-circuit diagrams
    - Science Resource Book "Series and Parallel Circuits"
- Part 4- Solving the String-of-Lights Problem
    - Set the scene and simulate a burned-out bulb
    - Test different circuit designs
    - Science Resouce Book "Science Practices" and "Engineering Practices" and "Thinking Like an Engineer" and "Engineering a Solar Lighting System"

Investigation 2

- Part 1- Magnets and Materials
    - Observe magnets and investigate what sticks to magnets
    - Introduce bags of test objects and predict which objects will stick and then test
    - Introduce iron detecting and use magnets to detect iron
    - Explore outdoors with magnets
    - View online activity
- Part 2- Magnetic Fields
    - Explore magnets interactions
    - Introduce attract and repel and bar magnets and poles
    - Introduce a compass
    - Investigate magnetism through materials
    - Introduce two demonstrations and then introduce magnetic field
    - Science Resouce Book "When Magnet Meets Magnet"
    - Label magnetic poles
    - View video on magnets "All About Magnets"
    - View online activities
- Part 3- Magnetic Force
    - Introduce force and discuss how to measure the force
    - Introduce the investigation and then report the force of attraction
    - Graph the data
    - Science Resource Book "Magnificent Magnetic Models" and "Make a Magnetic Compass"

Investigation 3

- Part 1- Building an Electromagnet
    - Introduce the challenge and review magnetic interactions
    - Explore magnetic fields in circuits
    - Design electromagnets and share designs
    - Science Resource Book "Electricity Creates Magnetism"
- Part 2- Changing the Strength
    - Plan and begin the Number-of-winds investigation
    - Graph the results
    - View online activities

- Science Resouce Book "Using Magnetic Fields" and "Electromagnets Everywhere"

- Part 3- Reinventing the Telegraph
  - Discuss communication device and history of the telegraph
  - Build a telegraph system and invent a code
  - Discuss the S-T-R-E-A-M code and send messages using two codes
  - Science Resource Book "Morse Gets Clicking"
  - Send messages a long distance and troubleshoot problems

Investigation 4

- Part 1- Presence of Energy
  - Review the energy chart
  - Candle demonstration
  - Energy Stations
  - Science Resource Book "Energy"
- Part 2- Rolling Balls Down Slopes
  - Introduce and investigate balls and ramps
  - Offer the two-system challenge
  - Introduce speed
  - Discuss designing an experiment and establish the procedures (notebook sheet 23) and gather speed data
  - Introduce potential and kinetic energy
  - Science Resouce Book "What Causes Change of Motion"

- Part 3- Collisions
  - Introduce obstacles
  - Explore corks on runways
  - Design collision experiments
  - Review forces and introduce friction
  - Discuss a motion experiment and analyze large ball data at different starting positions and analyze different masses from the same starting position
  - Science Resource Book "Bowling" and "Forces and Energy" and "Potential and Kinetic Energy at Work"
  - View video on transfer of energy

Investigation 5

- Part 1- Forms of Waves
  - Display the tone generator
  - Demonstrate water waves and discuss water observations
  - View video on waves
  - Demonstrate how to make waves with ropes and then have students do
  - Introduce a waveform and define three wave properties
  - View video on on sound

    - Science Resource Book "Waves" and "More about Sound"
- Part 2- Light Travels
    - Discuss vision
    - Introduce mirrors
    - Go outdoors using mirrors
    - introduce light and relection
    - Practice relecting light
    - Start the reflection challenges
    - Observe light through water
    - View video "All About Light"
    - Science Resouce Book "Light Interactions" and "Throw a Little on Sight" and "More Light on the Subject"

- Part 3- Engineering with Solar Cells
    - Review waves with a video
    - Solar-cell investigation outdoors- use the solar cell to run the motor
    - Science Resource Book "Alternative Sources of Electricity" and "Ms. Osgood's Class Report

Activities to Differentiate Instruction

Differentiation for special education:

- General modifications may include:
    - Modifications & accommodations as listed in the student's IEP
    - Assign a peer to help keep student on task
    - Modified or reduced assignments
    - Reduce length of assignment for different mode of delivery
    - Increase one-to-one time
    - Working contract between you and student at risk
    - Prioritize tasks
    - Think in concrete terms and provide hands-on-tasks
    - Position student near helping peer or have quick access to teacher
    - Anticipate where needs will be
    - Break tests down in smaller increments
- Content specific modifications may include:

Differentiation for ELL's:

- General modifications may include:
    - Strategy groups
    - Teacher conferences
    - Graphic organizers
    - Modification plan
    - Collaboration with ELL Teacher
    - Model and encourage the use of new vocabulary

    - Project the equipment photo card for each objects and write the object's name on the word wall
    - Provide sentence frames for students who need them
    - Use Spanish provided resources if applicable
- Content specific vocabulary important for ELL students to understand include: battery, bulb base. bulb casing, circuir, closed circuit, component, conductor, contact point, D-cell, electric current, electricity, energy, energy source, filament, insulator, light, lightbulb, metal, motion, motor, open circuit, parallel circuit, series circuit, shaft, short circuit, switch, system, terminal, transfer, wire, attrat, compass, force, gravity, induced magnetism, interact, iron, magnet, magnetic field, magnetism, North pole, opposite, permanent magnet, pole, repel, South pole, steel, temporary magnet, code, coil, core, electromagnet, electromagnetism, key, river, telegraph, collide, friction, fuel, heat, kinetic energy, potential energy, sound, transfer of energy,amplitude, compression, cycle, frequency, mirror, peak, ray, reflect, reflection, refract, refraction, solar cell, trough, wave, wavelength

Differentiation to extend learning for gifted students may include:

- Home/School Extension Activities
- Online Activities
- Cross Interdisciplinary Activities
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    - Utilize the Math extension problems and Science extensions provided in Foss Teacher Manual
    - Make schematic diagrams
    - Start a toy collection
    - Explore energy-use meters
    - Build a flashlight
    - Research solar cell technology
    - Make a silent alarm
    - Make a compass
    - Explore different magnets
    - Make a rheostat
    - Make a model motor
    - Build a cardboard telegraph
    - Observe symmetry of faces
    - Construct a periscope
    - Create sunprints

Integrated/Cross-Disciplinary Instruction

Technology: Energy Online Activities

Investigation 1, Part 1: Lighting a Bulb

- "Lighting a Bulb"
- "Flow of Electricity"

Investigation 1, Part 2: Conductors and Circuits

- "Tutorial: Simple Circuits"

- "Tutorial: Conductors and Insulators"
- "Turn on the Switch:
- "Conductor Detector"
- "D-Cell Orientation"

Investigation 2, Part 1: Magnets and Materials

- "Virtual Investigation: What Sticks and What Conducts?"

Investigation 2, Part 2: Magnetic Fields

- "Tutorials: Magnetic Poles and Magnetic Fields"
- "Magnetic Poles and Magnetic Poles Quiz"

Investigation 3, Part 2: Changing the Strength

- "Tutorial: Electromagnets
- "Virtual Electromagnet"
- "Kitchen Magnets"

Investigation 5, Part 2: Light Travels

- "Reflecting Light"

Investigation 5, Extensions

- "Colored Light"

Investigation 1: (refer to pages 165-170 in Teacher's Manual)

ELA Extensions:

Make a poster- make posters that convey a message about electricity or energy. You may want to have students choose a theme for the posters, such as safety with electricity, where electricity comes from, electricity uses, or insulators and conductors.

Imagine no electricity- have the class consider what daily life would be like without electricity and how people without electricity solve problems that require an energy source. Ask students to think abouot energy sources and how they could be used to solve those problems. Brainstorm with the class, and record their ideas on the board. Ask students to write a story that discusses one or more of the ideas.

Read Dear Mr. Henshaw- in the book, a boy decides to make a lunchbox alarm, and students might want to try making a lunchbox alarm for an end-of-module project.

Name the insulator/conductor- ask one student to name an object. The next student identifies it as a conductor or an insulator, and then names a new object. Have each student take a turn.

Math Extensions:

Problem of the Week A and B

Science Extensions:

Make schematic diagrams

Provide evidence for flow of electric current

Start a toy collection

Explore energy-use meters

Invite an electrician to lass

Make a single-pole-double-throw switch

Build a flashlight

Research solar cell technology

Make a silent alarm

Investigation 2: (refer to pages 220-222 in Teacher's Manual)

ELA Extensions:

Write a story- have students brainstorm a list of things that might happen if they were magnetic, and then have them write a fantasy adventure story. They should think about what things they might stick to that would take them on an adventure. For example, they might stick to an ocean liner.

Write directions for compass use- for practice writing step-by-step directions and using the compass, have a group of students begin at a spot in the room. Using the compass and counting their steps, have students give directions to another spot in the room.

Math Extensions:

Problem of the Week

Science Extensions:

Make a compass

Conduct more force investigations

Explore different magnets

Detecting hidden magnets

Investigation 3: (refer to pages 264-266 in Teacher's Manual)

ELA Extensions:

Research forms of code

Investigate emergency codes

Math Extensions:

Problem of the Week

Science Extensions:

Make a rheostat

Compare magnets to electromagnets

Make a model motor

Build a cardboard telegraph

Change the electromagnet

Investigation 4: (refer to pages 312-314 in Teacher's Manual)

ELA Extensions:

Research safety technologies

Research roller coasters

Math Extensions:

Problem of the Week

Science Extensions:

Rolling balls outdoors on slopes

Investigation 5: (refer to pages 374-376 in Teacher's Manual)

ELA Extensions:

Travel through the looking glass

Write mirror messages

Math Extensions:

Problem of the Week

Science Extensions:

Share Light

Observe symmetry of faces

Construct a periscope

Create sunprints

Art Extension

Create mirror picture

MA.4.OA.A	Use the four operations with whole numbers to solve problems.
MA.4.OA.C	Generate and analyze patterns.
MA.4.NBT.A	Generalize place value understanding for multi-digit whole numbers.
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.
MA.4.NBT.B.5	Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
LA.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.
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.
MA.4.NF.B.3a	Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
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.
MA.4.NF.B.3b	Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model.
MA.4.NF.B.3c	Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.
MA.4.NF.B.3d	Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.
LA.RF.4.3.A	Use combined knowledge of all letter-sound correspondences, syllabication patterns, and morphology (e.g., roots and affixes) to read accurately unfamiliar multisyllabic words in context and out of context.
LA.RF.4.4.A	Read grade-level text with purpose and understanding.
LA.SL.4.1.A	Explicitly draw on previously read text or material and other information known about the topic to explore ideas under discussion.
LA.SL.4.1.C	Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others.
LA.SL.4.5	Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.

Resources

FOSSweb provides a list of recommended resources for each module. These resources include listings for nonfiction and fiction books for students, resource books for teachers, websites, images, videos, and local resources that extend the hands-on science activities in each module.

URL : https://www.fossweb.com/web/foss-fossweb/additional-resources-books-xslt?dDocName=G4292315#non-fiction-books

Description: Here is a list of recommended nonfiction books about Energy

URL: https://www.fossweb.com/web/foss-fossweb/additional-resources-books-xslt?dDocName=G4292315#fiction-books

Description: Here is a list of recommended fiction books about Energy

URL: https://www.fossweb.com/foss-content?htmlContentID=G3955636

Description: Here are the Interactive Whiteboard files that accompany this module

URL: www.pbs.org

Description: Find out about AC (alternating current) and DC (direct current) and why both are used at this PBS American Experience website, *Edison's Miracle of Light*. Includes a teacher guide.

URL: www.pbs.org

Description: A PBS website devoted to the film entitled "Hoover Dam." Rising more than 215 meters (700 feet) above the raging waters of the Colorado River, it was called one of the greatest engineering works in history. This website includes information about the film, people and events, a timeline, maps, and a teacher guide that supports the film. Includes a teacher guide.

URL: littleshop.physics.colostate.edu

Description: This is an interesting experiment using a balloon and a computer monitor.

URL: www.att.com

Description: Time line of technologies pioneered at AT&T's Bell Laboratories, beginning with the telephone in 1876 and continuing through 1993. Covers such innovations as electronic recording, sound motion pictures, transatlantic telephone services, stereo recording, transistors, the solar cell, and cellular phones.

URL: www.bbc.co.uk

Description: See which object completes the circuit.

URL: www.bbc.co.uk

Description: A really good game for making and changing electrical circuits that can be switched from model to circuit diagram. The game allows the manipulation of cells, wires, bulbs buzzers and resistors to complete circuits.

URL: www.eia.doe.gov

Description: This site contains activities, games, glossary, energy history and links to other resources.

URL: www.exploratorium.edu
Description: An experiment for learning about human color perception by using colored lights to make additive color mixtures (colors from different lights).
Franklin's Kite

URL: cst.mos.org
Description: Franklin's kite experiment is well-known by many, but did he actually conduct it the way we have learned? Check out this website from the Museum of Science in Boston for information.

URL: www.panoramas.dk
Description: Find out about different types of mirrors using interactive animation.

URL: www.usbr.gov
Description: This website about Hoover Dam is sponsored by the U.S. Bureau of Reclamation (USBR). It includes the Story of Hoover Dam, Education Information, and notes about visiting Hoover Dam. Adult guidance may be needed.

URL: www.howstuffworks.com
Description: What is inside the black box known as a computer monitor? Check this How Stuff Works website to find out.

URL: www.lcra.org
Description: Find out how electricity is delivered to your home and other places we use it.

URL: science.howstuffworks.com
Description: The basic idea behind an electromagnet is extremely simple: By running electric current through a wire, you can create a magnetic field. Explore the devices that use electromagnets and try some electromagnetic projects for yourself.

URL: www.connected-earth.com
Description: Find out how telegraphs, telephones and other electronic devices actually work via a range of interactive activities designed to be fun and informative. Young students may need to adult assistance.

URL: science.howstuffworks.com
Description: Find out how solar cells convert the sun's energy directly into electricity. Young students may need adult assistance.

URL: electronics.howstuffworks.com
Description: Find out how a speaker (or headphone) translates electrical signals and translates them back into physical vibrations to create sound waves that you can hear. Young students may need adult assistance.

URL: entertainment.howstuffworks.com
Description: Check out this website from How Stuff Works to find out how a television works, from what has to happen in your brain to the cathode ray technology that creates the image. Young students may need adult assistance.

URL: www.bbc.co.uk
Description: Drag different angled mirrors into the path of light to see how the direction of light is changed.

URL: www.mrl.ucsb.edu
Description: Guess different materials based on a set of clues.

URL: www.kids.esdb.bg
Description: Student-friendly site includes energy definitions, activities and resources.

URL: kidskonnect.com
Description: Student-friendly explorations of matter and energy.

URL: ts.nist.gov
Description: This page sponsored by the National Institute of Standards and Technology is a good resource for information about transforming the United States into a 'Metric America.'

URL: www.physics4kids.com
Description: This site includes an overview and information about radiation, visible light, light structure, reflection, refraction, lenses, and lasers.

URL: www.skytopia.com
Description: A graphically illustrated guide to various oddities about color and light.

URL: littleshop.physics.colostate.edu
Description: Static charge is experienced using strips of clear tape and a computer monitor.

URL: www.andythelwell.com
Description: This is an interactive website for students to use. The website has 5 sections: what makes circuits work?, conductors and insulators, all about switchs, changing circuits, and diagrams. Each section has three parts: useful information,an activity/game, and a quiz. A very engaging student-friendly site!

URL: image.gsfc.nasa.gov
Description: Here´s a website to begin learning about the Earth´s magnetic field. This NASA website includes information, movies and pictures about magnetism, the magnetosphere and how Earth´s magnetic field shields the planet from solar storms.

URL: www.learner.org
Description: The activities in this lab are designed to give you ideas about light—and also about how you can use technology to explore light—using virtual simulations.

URL: cst.mos.org
Description: This site from the Boston Museum of Science includes load of information about their amazing Theater of Electricity. You can find information about the history and construction of the theater and its world´s largest air-insulated Van de Graaff generator, Tesla coils, and lightning, plus photos, movies, and teacher resources.

URL: www.tryscience.org
Description: Find out about more than 400 science and technology centers and museums worldwide. Use an interactive map of the world to find and explore a science and technology center or museum near you. You can also find online adventures and field trips, ideas for experiments at home, plus live webcams. TryScience.org is your gateway to experience the excitement of contemporary science and technology through on and offline interactivity with science and technology centers worldwide. TryScience is brought to you

through a partnership between IBM Corporation, the New York Hall of Science (NYHOS), the Association of Science-Technology Centers (ASTC), and science centers worldwide.

URL: www.sciencemadesimple.com
Description: This site from Science Made Simple describes how static electricity is created and its effects.

21st Century Skills

CAEP.9.2.4.A.2	Identify various life roles and civic and work - related activities in the school, home, and community.
CAEP.9.2.4.A.3	Investigate both traditional and nontraditional careers and relate information to personal likes and dislikes.
CAEP.9.2.4.A.4	Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.