EAST PENN SCHOOL DISTRICT

4th Grade Science

July 14, 2025

ELEMENTARY STEELS VERTICAL ARTICULATION

		K	1	2	3	4	5
TRIMESTER 1	Project	*Designing a Severe Weather Bag*	*Designing an Animal Sanctuary*	*Record & Observe Life Cycle of Butterfly*	*Design & Build a Cart that can stop at a specific location*	*Create a model of energy transfer or transformation*	*Create a model showing the cycling of matter in an ecosystem*
	Theme	**Weather**	**Plant & Animal Survival**	**Organisms & Their Habitat**	**Investigating Forces**	**Energy Transfer**	**Energy & Matter in Ecosystems**
TRIMESTER 2	Project	*Designing a Mini Golf Course*	*Building a Communication Device*	Repurpose/ Design Something New	*Research & Create a Presentation on an Endangered Animal*	*Analyzing the Structure & Function of a Living Thing Research*	*Investigating Chemical Reactions*
	Theme	**Pushes & Pulls**	**Exploring Light & Sound**	**Properties of Matter**	**Habitats & Change**	**Structure & Functions of Living Things**	**Investigating Matter**
TRIMESTER 3	Project	*Creating a Model for an Animal, Plant, or Person to live in*	*Creating a Model showing how the Sun impacts the moon*	*Record & Create a Travel Journal Based on National Park Virtual Visits*	*Design a solution to stop hail damage*	*Model a tool or concept that will reduce the impact of a natural disaster.*	*Carbon Footprint Research Project*
	Theme	**Needs of Plants & Animals**	**Sun, Moon & Stars**	**Exploring Land & Water**	**Weather & Climate**	**Processes That Shape Earth**	**Solar System & Our Place In IT**

Life Science **Phsycial Science** **Earth & Space Science**

Unit 1: Overview

Topics & Vocabulary Terms	**Energy Concepts:** energy transfer, energy transformation, energy causes change, forms of energy (light, sound, heat, electrical energy), stored energy, scientific principle, construct, design, converts, material, constraint, system, criteria. **Energy & Motion:** Energy, Stored Energy, Change, Sound Energy, Heat Energy, Light Energy, Energy of Motion, Speed, Iteration, Limitation, Solution, Troubleshooting **Collisions**: Collide, Sound
Projects & Artifacts	Students will create a model demonstrating their understanding of energy transfer and transformation. This model may take the form of a drawing, written explanation, verbal explanation, physical model.
Resources	Core Knowledge: Energy Transfer and Transformation [Teacher Guide & Student Reader] STEELS Routine Investigation materials (toy cars, ramps, magnets, various surfaces, etc.)

Unit 2: Overview

Topics & Vocabulary Terms	**Key Vocabulary:** structure, function, behavior, reproduction, growth, survival, sense, system, visual system, auditory system, reflect, pupil, vision, stimulus, response
Projects & Artifacts	Built to Survive: Exploring Structure and Function in Living Things — A project where students choose a plant or animal, research physical structures and their functions, then create a visual product (poster, brochure, slideshow, model, video) explaining how these structures help the organism survive.
Resources	Core Knowledge: Structures and Functions of Living Things [Teacher Guide & Student Reader] STEELS Routine

Unit 3: Overview

Topics & Vocabulary Terms	**Earth Processes & Natural Hazards**: rock formations, landscape, vegetation, cause and effect, phenomenon, data, Earth's features, maps, solutions, reduce, impacts, natural hazard, constraints, fossil types, rock layers, patterns, sedimentation, Earth's spheres (hydrosphere, geosphere, biosphere, atmosphere), earthquake, magnitude, cause/effect, volcano, eruption, weathering, erosion, vegetation.
Projects & Artifacts	Students create a **model** that demonstrates their understanding of one natural Earth process and proposes a solution to reduce its impact on humans.
Resources	Core Knowledge: Processes that Shape the Earth [Teacher Guide & Student Reader] STEELS Routine Demonstration materials (plastic bottle, gravel, water, Hoffman cookie for weathering)

Unit 1: Energy Transfer and Transformation

STAGE 1 | DESIRED RESULTS

Definition of Energy
3.2.4.A Use evidence to construct an explanation relating the speed of an object to the energy of that object.

Conservation of Energy and Energy Transfer
3.2.4.B Make and communicate observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

Relationship Between Energy and Forces
3.2.4.C Ask questions and predict outcomes about the changes in energy that occur when objects collide.

Energy in Chemical Processes and Everyday Life
3.2.4.D Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

Information Technologies and Instrumentation
3.2.4.G Generate and compare multiple solutions that use patterns to transfer information.

Natural Resources
3.3.4.D Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

Technology & Engineering

Transfer

Whenever there is change, there is some form of energy causing that change.

Meaning

Big Ideas:

- Energy can be modeled as either motions of particles or as being stored in force fields.
- The total change of energy in any system is always equal to the total energy transferred into or out of the system.
- Forces between objects can result in transfer of energy between these objects.
- Producing energy useful in everyday life means to convert some available energy into a desired form, which is then delivered to users.
- All materials, energy, and fuels that humans use are derived from natural sources, some of which are renewable over time and others are not.
- Useful modern technologies and instruments have been designed based on an understanding of waves and their interactions with matter.
- Design optimization is driven by criteria and constraints.
- Design in technology and engineering is iterative.

Essential Questions:

- What is energy?
- What is meant by conservation of energy? How is energy transferred between objects or systems?
- How are forces related to energy?
- How do food and fuel provide energy? If energy is conserved, why do people say it is produced or used?
- How are instruments that transmit and detect waves used to extend human senses?
- How does changing technology impact the individual, culture, and environment?
- How does technology and engineering relate to other content areas?
- Why is there no single correct solution in design?
- Why is it important for people to be technologically literate?
- How do the values and beliefs of societies shape attitudes toward technology?
- What is the value of iteration within the design process?
- What are the characteristic properties and behaviors of waves?
- What is light?
- How can one explain the varied effects that involve light?

Applying, Maintaining, and Assessing Technological Products and Systems 3.5.3-5.I Design solutions by safely using tools, materials, and skills. 3.5.3-5.K Judge technologies to determine the best one to use to complete a given task or meet a need. **Design in Technology & Engineering Education** 3.5.3-5.M Demonstrate essential skills of the engineering design process. 3.5.3-5.N Identify why a product or system is not working properly. 3.5.3-5.O Describe requirements of designing or making a product or system. 3.5.3-5.R Apply tools, techniques, and materials in a safe manner as part of the design process. 3.5.3-5.Q Practice successful design skills. 3.5.3-5.U Evaluate designs based on criteria, constraints, and standards. **Integration of Knowledge, Technologies, and Practices** 3.5.3-5.Z Create a new product that improves someone's life. **Wave Properties** 3.2.4.E. Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can	• Technology and engineering are interdisciplinary, relating to more than one content area. • Use of technology can lead to fundamental changes in individuals, human cultures, and the environment. • Technologically literate people are well equipped to learn about and use technological products and systems • The values and beliefs of societies shape attitudes toward technology. • Waves are repeating patterns of motion that transfer energy and information without transferring matter.	• What other forms of electromagnetic radiation are there? • How are instruments that transmit and detect waves used to extend human senses?
	Acquisition	
	Knowledge: • I understand that the faster a given object is moving, the more energy it possesses. **(Speed)** • I know that energy can be moved from place to place by moving objects or through sound, light, or electric currents. **(Transfer)** • I understand that energy is present whenever there are moving objects, sound, light, or heat. **(Energy)** 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.	**Skills:** • I can use evidence (e.g., measurements, observations, patterns) to construct an explanation. • I can make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. • I can ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. • I can apply scientific ideas to solve design problems. • I can develop a model using an analogy, example, or abstract representation to describe a scientific principle • I can develop a model to describe phenomena.

cause objects to move. **Information Technologies and Instrumentation** 3.2.4.G Students who demonstrate understanding can generate and compare multiple solutions that use patterns to transfer information.	• I know when objects collide, the contact forces **transfer** energy so as to change the objects' motions. • I understand 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. • I know the expression "produce energy" typically refers to the conversion of **stored energy** into a desired form for practical use. • I understand 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. • I know that **research** on a problem should be carried out before beginning to design a solution. • I know that tests are often designed to identify failure points or difficulties. • I understand that different solutions need to be tested in order to find out which of them best solves the problem.	• I can generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. • I can safely use grade-appropriate tools, materials, and processes to build projects. • I can engage in "tinkering" to improve a design. • I can find answers to technological questions. • I can try new technologies and generate strategies for improving existing ideas. • I can develop written and oral communication skills • I can develop a model using an analogy, example, or abstract representation to describe a scientific principle. • I can develop a model to describe phenomena. • I can generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.

	• I can determine that 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 to voice–and vice versa. • I understand that 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. • I understand that an object can be seen when light reflected from its surface enters the eyes.	

Unit 2: Structures and Functions of Living Things

STAGE 1 | DESIRED RESULTS		
Structure and Function 3.1.4.A Students who demonstrate understanding can construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. **Information Processing**	***Transfer***	
	The structures and sensory systems of plants and animals contribute their survival and interactions with their environment.	
	Meaning	
	Big Ideas: • Organisms have characteristic structures, functions, and behaviors that allow them to grow, reproduce, and die.	**Essential Questions:** • How do the structures of organisms enable life's functions? • How do organisms detect, process, and use information about the environment?

STAGE 1 | DESIRED RESULTS

<table>
<tr>
<td rowspan="3">3.1.4.B Students who demonstrate understanding can 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.

Electromagnetic Radiation
3.2.4.F Demonstrate understanding can develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.</td>
<td>• Animals have external and internal sensory receptors that detect different kinds of information that then gets processed by the brain.
• Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave pattern of changing electric and magnetic fields that interact with matter</td>
<td>• What is light? How can one explain the varied effects that involve light?
• What other forms of electromagnetic radiation are there?</td>
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<tr>
<td colspan="2">Acquisition</td>
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<tr>
<td>Knowledge:
• I understand that plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.
• I know that 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.
• I understand that an object can be seen when light reflected from its surface enters the eyes</td>
<td>Skills:
• I can construct an argument with evidence, data, and/or a model.
• I can use a model to test interactions concerning the functioning of a natural system.
• I can develop a model to describe phenomena.</td>
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Unit 3: Processes that Shape the Earth

STAGE 1 | DESIRED RESULTS

The History of Planet Earth
3.3.4.A Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

Earth Materials and Systems
3.3.4.B Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

Plate Tectonics and Large-Scale System Interactions
3.3.4.C Analyze and interpret data from maps to describe patterns of Earth's features

Natural Hazards
3.3.4.E Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

Structure and Function
3.1.4.A
Students who demonstrate understanding can construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction."

Transfer

Analyzing rock formations, fossils, weathering, erosion, and plate tectonics helps explain how Earth's surface changes over time.

Meaning

Big Ideas:

- **We can infer Earth's planetary history by features we observe today.**
- Changes we observe on Earth are the result of energy flowing and matter cycling between interconnected systems (the geosphere, hydrosphere, atmosphere, and biosphere).
- **Plate tectonics explains the past and current movements and features of the rocks at Earth's surface**
- **Natural processes can cause sudden or gradual changes to Earth's systems, some of which may adversely affect humans.**

Essential Questions:

- How do people reconstruct and date events in Earth's planetary history?
- How and why is Earth constantly changing?
- Why do the continents move, and what causes earthquakes and volcanoes?
- How do Earth's surface processes and human activities affect each other?
- How do humans depend on Earth's resources?
- How do natural hazards affect individuals and societies?

Acquisition

Knowledge:

Skills:

- I can make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.
- I can analyze and interpret data to make sense of phenomena using logical reasoning

Information Processing 3.1.4.B Students who demonstrate understanding can 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.	• I understand 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. • I know living things affect the physical characteristics of their regions. • I know 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. • I know 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.	• I can Identify the evidence that supports particular points in an explanation. • I can obtain and combine information from books and other reliable media to explain phenomena. • I can generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.

	• I understand 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. • I know testing a solution involves investigating how well it performs under a range of likely conditions.	