

EASTON PUBLIC SCHOOLS

Grade 4 Science Curriculum

Stage 1

UNIT 1: MATTER AND ENERGY

Stage 1 – Desired Results

Transfer Goal(s)

Students will independently be able to use their learning to...

Foundational Transfer Goals:

- **Demonstrate Character**
 - Build positive relationships and make responsible choices that are physically, socially, emotionally, and intellectually sound.
- **Communicate & Collaborate**
 - Express ideas in a variety of ways and work responsibly with others.
- **Embrace Curiosity**
 - Investigate to seek knowledge and truth.

Science Transfer Goals:

- **Inquire**
 - Engage in scientific and engineering practices, individually and collaboratively, to design solutions and construct explanations supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
- **Analyze data & think mathematically**
 - Collect, analyze and interpret data, and apply appropriate mathematical concepts to evaluate the data, test solutions or to make logical conclusions.
- **Communicate**
 - Communicate the results of scientific investigations in multiple formats, using evidence to analyze observations and justify conclusions.
- **Make informed decisions**
 - Utilize scientific knowledge to make informed decisions as they relate to and impact the natural environment and society.

Standards

Science and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
 2. Developing and using models
 3. Planning and carrying out investigations
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4. Analyzing and interpreting data
 5. Using mathematics and computational thinking
 6. Constructing explanations (for science) and designing solutions (for engineering)
 7. Engaging in an argument from evidence
 8. Obtaining, evaluating, and communicating information

Standard/Strand: Physical Science

PS3. Energy

PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object.

PS3-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide.

Meaning

Enduring Understandings

Students will understand that...

- Matter has different properties depending on the number and kind of atoms that make it up.
- Unbalanced forces cause objects to move.

Essential Questions

Students will keep considering...

- Why do forces make objects move?
- What causes matter to change?
- What is energy doing around us?

Acquisition of Knowledge & Skills
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Knowledge

Students will know...

- Fast-moving objects transfer more energy during a collision compared to slow-moving objects
- Energy takes different forms (kinetic and potential)
- Energy is the ability to do work (change in matter and form)
- Systems and objects have energy
- Energy can be transferred into or out of objects or systems by force
- Friction is a force that slows motion
- Key vocabulary - cause and effect, energy, force, friction, speed, weight, work

Skills

Students will be able to...

- Analyze how moving objects have energy, and how energy transfers in a collision.

UNIT 2: SHAPING EARTH'S SURFACE

Stage 1 – Desired Results

Transfer Goal(s)

Students will independently be able to use their learning to...

Foundational Transfer Goals:

- **Demonstrate Character**
 - Build positive relationships and make responsible choices that are physically, socially, emotionally, and intellectually sound.
- **Communicate & Collaborate**
 - Express ideas in a variety of ways and work responsibly with others.
- **Embrace Curiosity**
 - Investigate to seek knowledge and truth.

Science Transfer Goals:

- **Inquire**
 - Engage in scientific and engineering practices, individually and collaboratively, to design solutions and construct explanations supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
- **Develop models**
 - Develop, evaluate and use models to communicate scientific phenomena.
- **Communicate**
 - Communicate the results of scientific investigations in multiple formats, using evidence to analyze observations and justify conclusions.
- **Make informed decisions**
 - Utilize scientific knowledge to make informed decisions as they relate to and impact the natural environment and society.

Standards

Science and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
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8. Obtaining, evaluating, and communicating information

Standard/Strand: Earth and Space Science

ESS1. Earth's Place in the Universe

- 4-ESS1-1. Use evidence from a given landscape that includes simple landforms and rock layers to support a claim about the role of erosion or deposition in the formation of the landscape over long periods of time.

ESS2. Earth's Systems

- 4-ESS2-1. Make observations and collect data to provide evidence that rocks, soils, and sediments are broken into smaller pieces through mechanical weathering and moved around through erosion
- 4-ESS2-2. Analyze and interpret maps of Earth's mountain ranges, deep ocean trenches, volcanoes, and earthquake epicenters to describe patterns of these features and their locations relative to boundaries between continents and oceans.

ESS3. Earth and Human Activity

- 4-ESS3-1. Obtain information to describe that energy and fuels humans use are derived from natural resources and that some energy and fuel sources are renewable and some are not.

Meaning	
Enduring Understandings Students will understand that...	Essential Questions Students will keep considering...
• Energy changes Earth's surface over time • Tectonic plates move and create landforms. • The force of moving water erodes sediment..	• How could wind and rain shape Earth's surface? • How could geologic clues explain how Earth's landscape has changed over time? • How do different systems interact with each other?

Acquisition of Knowledge & Skills	
Knowledge Students will know...	Skills Students will be able to...
• The Earth's interior provides the energy that changes Earth's surface • Landforms occur in patterns because of how Earth's interior layers interact and change • Earth's surface can only change with enough energy. • Moving water can shape the land around it	• Identify and analyze the processes that have changed Earth's surface over time, resulting in patterns of Earth's features. • Describe how rocks and fossils can be used to identify the processes that have changed Earth's landmass.

- Weathering and erosion are two processes that shape the land by breaking down Earth's materials into smaller pieces and transporting them to new locations
- Different processes, including weathering and erosion, have the effect of reshaping and reforming the matter that makes up different rocks in the rock cycle.
- The process that form sedimentary rock are the same as those that form fossils, so sedimentary rocks often hold fossils
- How fossils are formed, scientists can determine a fossil's age based on where it is found relative to another fossil.
- The movement of Earth's tectonic plates causes landforms (cause and effect) in specific places on Earth (patterns)
- Water erodes more sand as the slope gets steeper compared to a slight slope or flat surface.
- Scientists identify evidence in rock formations and rock layers to determine how Earth's surface has changed over time.
- We know that the Earth was once a super continent of land masses that drifted apart into smaller land masses over time based on the discovery of plant and animal fossils
- Key vocabulary - convergent, divergent and transform boundaries, erosion, weathering, fossil, rocks and rock cycle, sediment, tectonic plates

UNIT 3: EARTH AND HUMAN ACTIVITY

Stage 1 – Desired Results

Transfer Goal(s)

Students will independently be able to use their learning to...

Foundational Transfer Goals:

- **Exhibit Resilience**
 - Persevere when facing challenges and taking risks.
- **Communicate & Collaborate**

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- Express ideas in a variety of ways and work responsibly with others.
 - **Engage Locally & Globally**
 - Act with respect, empathy and responsibility in a local and global community.
 - **Think Critically & Innovate**
 - Generate new ideas, make informed decisions, draw conclusions, and solve problems.

Content Transfer Goals:

- **Inquire**
 - Engage in scientific and engineering practices, individually and collaboratively, to design solutions and construct explanations supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
- **Problem solve**
 - Engage in the engineering/scientific design process by defining problems, designing and refining optimal solutions, and taking into account constraints or limitations that impact real-world situations.
- **Analyze data & think mathematically**
 - Collect, analyze and interpret data, and apply appropriate mathematical concepts to evaluate the data, test solutions or to make logical conclusions.
- **Develop models**
 - Develop, evaluate and use models to communicate scientific phenomena.
- **Make informed decisions**
 - Utilize scientific knowledge to make informed decisions as they relate to and impact the natural environment and society.

Standards

Science and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in an argument from evidence
8. Obtaining, evaluating, and communicating information

Standard/Strand: Earth and Space Sciences

ESS3. Earth and Human Activity

4-ESS3-2. Obtain information to describe that energy and fuels humans use are derived from natural resources and that some energy and fuel sources are renewable and some are not.

4-ESS3-2. Evaluate different solutions to reduce the impacts of a natural event such as an earthquake, blizzard, or flood on humans.

Standard/Strand: Technology/Engineering**ETS1. Engineering Design**

4.3-5-ETS1-3. Plan and carry out tests of one or more design features of a given model or prototype in which variables are controlled and failure points are considered to identify which features need to be improved. Apply the results of tests to redesign a model or prototype.

4.3-5-ETS1-5. Evaluate relevant design features that must be considered in building a model or prototype of a solution to a given design problem.

Meaning

Enduring Understandings

Students will understand that...

- The Earth's surface has changed over time.
- The Earth's hydrosphere and geosphere are shaped by one another.
- Human interaction with water affects the Earth.

Essential Questions

Students will keep considering...

- How does the particle size of an Earth material affect its permeability to water?
- How can the problem of flooding in urban environments be solved?
- Students analyze data from different sources to study the effects of hydroelectric dams on native Chinook salmon populations.

Acquisition of Knowledge & Skills
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Knowledge

Students will know...

- Water on earth is constantly cycling from one state to another, depending on the amount of heat from the sun.
- Groundwater, such as the Ogallala Aquifer, is the result of two interacting systems: the hydrosphere and the geosphere.
- Aquifers, such as the Ogallala Aquifer, play an important role in the lives of people who live in high plains regions.
- Engineers can use scientific knowledge about how aquifers absorb and filter water to design solutions to urban flooding and polluted stormwater.
- Engineers follow a process to help guide them from a

Skills

Students will be able to...

- Analyze how water moves around Earth, interacting with all of Earth's systems and influencing weather.
- Compare solutions for reducing the impacts of urban flooding and water pollution.
- Describe how the use of dams provides energy but also impacts the environment.

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- problem to a technology that solves a problem.
 - Chinook Salmon are part of the biosphere and live in the hydrosphere.
 - People can harness the energy of moving water.
 - People use energy resources, but these uses can have an effect on the environment.
 - **Key Vocabulary** - porosity, permeability, prototype, water cycle, ground water, engineer, aquifer, hydroelectric power, dam, flooding
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UNIT 4: PLANT AND ANIMAL STRUCTURES

Stage 1 – Desired Results

Transfer Goal(s)

Students will independently be able to use their learning to...

Foundational Transfer Goals:

- **Embrace Curiosity**
 - Investigate to seek knowledge and truth.
- **Engage Locally & Globally**
 - Act with respect, empathy and responsibility in a local and global community.

Science Transfer Goals:

- **Inquire**
 - Engage in scientific and engineering practices, individually and collaboratively, to design solutions and construct explanations supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
 - **Analyze data & think mathematically**
 - Collect, analyze and interpret data, and apply appropriate mathematical concepts to evaluate the data, test solutions or to make logical conclusions.
 - **Develop models**
 - Develop, evaluate and use models to communicate scientific phenomena.
 - **Communicate**
 - Communicate the results of scientific investigations in multiple formats, using evidence to analyze observations and justify conclusions.
 - **Make informed decisions**
 - Utilize scientific knowledge to make informed decisions as they relate to and impact the natural environment and society.
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Standards

Science and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in an argument from evidence
8. Obtaining, evaluating, and communicating information

Standard/Strand: Life Science

LS1. From Molecules to Organisms: Structures and Processes

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

Meaning

Enduring Understandings

Students will understand that...

- Living things depend on their environment and one another for survival.
- Energy flows through a food web.
- Plants and animals have internal and external structures that enable them to survive in their environments.

Essential Questions

Students will keep considering...

- Why are plant structures important for their survival, growth, behavior, and reproduction?
- How are the structures of a tadpole/frog important to their survival, growth, behavior, and reproduction?

Acquisition of Knowledge & Skills

Knowledge

Students will know...

- A plant's structures are related to its ability to survive
- Plants give off oxygen and take in carbon dioxide

Skills

Students will be able to...

- Analyze how plants have structures that help them get what they need.
- Describe how the internal and external structures of frogs

- Transpiration occurs when the plants stomata are open, and transpiration is important because it contributes to the water cycle and it is affected by temperature.
- A life cycle describes how an organism is born, grows, and reproduces to create a new organism that repeats the cycle
- Frogs go through metamorphosis
- Frogs undergo a complete internal and external change during metamorphosis
- Frogs have certain requirements they have to meet in order to complete their full life cycle
- Students will know plants and animals have specific structures that allow them to access what they need to survive.
- Frogs have a unique life cycle that includes a unique transformation of its body structures.
- Key vocabulary - animal, change, ecosystem, food chain, food web, function, life cycle, metamorphosis, photosynthesis plant, reproduction, structure, transpiration

change as they move through their life cycle, allowing them to survive in their environment.

UNIT 5: ORGANISMS AND THEIR ENVIRONMENT

Stage 1 – Desired Results

Transfer Goal(s)

Students will independently be able to use their learning to...

Foundational Transfer Goals:

- **Exhibit Resilience**
 - Persevere when facing challenges and taking risks.
- **Communicate & Collaborate**
 - Express ideas in a variety of ways and work responsibly with others.
- **Embrace Curiosity**
 - Investigate to seek knowledge and truth.
- **Think Critically & Innovate**
 - Generate new ideas, make informed decisions, draw conclusions, and solve problems.

Science Transfer Goals:

- **Analyze data & think mathematically**
 - Collect, analyze and interpret data, and apply appropriate mathematical concepts to evaluate the data, test solutions or to make logical conclusions.
- **Communicate**
 - Communicate the results of scientific investigations in multiple formats, using evidence to analyze observations and justify conclusions.
- **Make informed decisions**
 - Utilize scientific knowledge to make informed decisions as they relate to and impact the natural environment and society.

Standards

Science and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in an argument from evidence
8. Obtaining, evaluating, and communicating information

Standard/Strand: Life Science**LS1. From Molecules to Organisms: Structure and Processes**

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

Meaning

Enduring Understandings

Students will understand that ...

- Sensory structures allow animals to process information from the environment, and then use that information to influence their behaviors.
- Physical and behavioral traits are passed down from parents to offspring.

Essential Questions

Students will keep considering...

- How do the variations of structures and behaviors in organisms help them adapt and survive?
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Acquisition of Knowledge & Skills

Knowledge

Students will know...

- Animals have structures that are made up of smaller parts, including sense receptors, that interact and work together to help the animal survive.
- Organisms have learned and innate behaviors.
- Adaptations help an organism survive in its environment.
- Adaptations provide individual organisms with a better chance of survival in their environment.

Skills

Students will be able to...

- Analyze how animals have structures to gather sensory information about their environment.
- Observe how animals change their behavior in response to various stimuli from the environment.
- Compare an organism's physical and behavioral traits, analyzing the role of heredity and the environment in determining and influencing those traits.

UNIT 6: ENERGY TRANSFERS

Stage 1 – Desired Results

Transfer Goal(s)

Students will independently be able to use their learning to...

Foundational Transfer Goals:

- **Demonstrate Character**
 - Build positive relationships and make responsible choices that are physically, socially, emotionally, and intellectually sound.
- **Exhibit Resilience**
 - Persevere when facing challenges and taking risks.
- **Communicate & Collaborate**
 - Express ideas in a variety of ways and work responsibly with others.
- **Embrace Curiosity**
 - Investigate to seek knowledge and truth.
- **Think Critically & Innovate**
 - Generate new ideas, make informed decisions, draw conclusions, and solve problems.

Science Transfer Goals:

- **Inquire**
 - Engage in scientific and engineering practices, individually and collaboratively, to design solutions and construct explanations supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
 - **Problem solve**
-

- Engage in the engineering/scientific design process by defining problems, designing and refining optimal solutions, and taking into account constraints or limitations that impact real-world situations.
- **Develop models**
 - Develop, evaluate and use models to communicate scientific phenomena.
- **Communicate**
 - Communicate the results of scientific investigations in multiple formats, using evidence to analyze observations and justify conclusions.

Standards

Science and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in an argument from evidence
8. Obtaining, evaluating, and communicating information

Standard/Strand: Physical Science

4-PS3 - Energy

PS3-2 Make observations to show that energy can be transferred from place to place by sound, light, heat and electric currents

PS3-4 Apply scientific principles of energy and motion to test and refine a device that converts kinetic energy to electrical energy or uses stored motion to cause motion to produce light or sound

3-5-ETS1 Engineering Design

ETS1 - 3 Plan and carry out tests of one or more design features of a given model or prototype in which variables are controlled and failure points are considered to identify which features need to be improved. Apply the results of tests to redesign a model or prototype.

ETS1 - 5 Evaluate relevant design features that must be considered in building a model or prototype of a solution to a given design problem.

Meaning

Enduring Understandings

Students will understand that...

- Simple machines help us do work.
- Potential energy can be changed into kinetic energy
- Engineers create prototypes to find solutions to design problems.

Essential Questions

Students will keep considering...

- How the position of a lever's fulcrum and the effort force affect the amount of force needed to lift a load.
- How levers can be used to change potential energy to kinetic energy to launch projectiles.
- How simple machines can be used to change energy from one form to another.

Acquisition of Knowledge & Skills**Knowledge**

Students will know...

- Forces cause all motion and are needed to transfer energy into or out of objects or systems.
- Seesaws redirect force and they can be both balanced or unbalanced
- All levers have the same structure so they can redirect force
- Catapults are machines that can change potential energy into kinetic energy so it can launch objects into the air
- trebuchets use levers to redirect force in a way that causes the potential energy to change to kinetic energy
- Engineers who want to design a technology that can launch objects into the air need to think about how simple machines can redirect force in a way that causes energy to change from potential energy to kinetic energy.
- Catapults can be thought of as systems
- **Key Vocabulary:** catapult, effort force, launch, lever, load, simple machine

Skills

Students will be able to...

- Analyze how levers are simple machines because they redirect force to make work easier.
- Test different levers to see how the positions of the effort force, load force, and fulcrum affect how force is redirected.
- Design and test a prototype catapult that uses a lever to see how well it can change potential energy into kinetic energy so it can launch an object.

UNIT 7: ELECTRICAL ENERGY**Stage 1 – Desired Results****Transfer Goal(s)**

Students will independently be able to use their learning to...

Foundational Transfer Goals:

- **Demonstrate Character**
 - Build positive relationships and make responsible choices that are physically, socially, emotionally, and intellectually sound.
- **Exhibit Resilience**
 - Persevere when facing challenges and taking risks.
- **Communicate & Collaborate**
 - Express ideas in a variety of ways and work responsibly with others.
- **Embrace Curiosity**
 - Investigate to seek knowledge and truth.
- **Think Critically & Innovate**
 - Generate new ideas, make informed decisions, draw conclusions, and solve problems.

Science Transfer Goals:

- **Inquire**
 - Engage in scientific and engineering practices, individually and collaboratively, to design solutions and construct explanations supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
- **Problem solve**
 - Engage in the engineering/scientific design process by defining problems, designing and refining optimal solutions, and taking into account constraints or limitations that impact real-world situations.
- **Develop models**
 - Develop, evaluate and use models to communicate scientific phenomena.
- **Communicate**
 - Communicate the results of scientific investigations in multiple formats, using evidence to analyze observations and justify conclusions.

Standards

Science and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in an argument from evidence
8. Obtaining, evaluating, and communicating information

Standard/Strand: Physical Science

PS3. Energy

PS3-2. Make observations to show that energy can be transferred from place to place by sound, light, heat, and electric currents.

PS3-4. Apply scientific principles of energy and motion to test and refine a device that converts kinetic energy to electrical energy or uses stored energy to cause motion or produce light or sound.

Standard/Strand: Technology/Engineering

ETS1. Engineering Design

ETS1-3. Plan and carry out tests of one or more design features of a given model or prototype in which variables are controlled and failure points are considered to identify which features need to be improved. Apply the results of tests to redesign a model or prototype.

ETS1-5. Evaluate relevant design features that must be considered in building a model or prototype of a solution to a given design problem.

Meaning

Enduring Understandings

Students will understand that...

- Electric energy is transferred in circuits and can do work, such as spin a motor.
- Knowledge of circuits can be applied to engineering.

Essential Questions

Students will keep considering...

- how electrical energy can be transferred by building circuits with motors and analyzing how the flow of current electricity through a circuit can change direction depending on the configuration of the circuit with the battery.

Acquisition of Knowledge & Skills

Knowledge

Students will know...

- Electricity is the movement of electrons through a conductor.
- Energy can be transferred from one place to another in a circuit.
- Circuits are used in electric cars.
- **Key Vocabulary:** acceleration, circuit, electricity, electric conductor, electric insulator, motor, direct current

Skills

Students will be able to...

- Explain the relationship between the structure of matter and electricity.
- Describe how energy is converted from electrical energy into another form of energy in a circuit.
- Build and refine a prototype electric car that is built with a circuit that transfers electrical energy and converts it into kinetic energy that moves the car.

UNIT 8: SOUND WAVES

Stage 1 – Desired Results

Transfer Goal(s)

Students will independently be able to use their learning to...

Foundational Transfer Goals:

- **Demonstrate Character**
 - Build positive relationships and make responsible choices that are physically, socially, emotionally, and intellectually sound.
- **Exhibit Resilience**
 - Persevere when facing challenges and taking risks.
- **Communicate & Collaborate**
 - Express ideas in a variety of ways and work responsibly with others.
- **Embrace Curiosity**
 - Investigate to seek knowledge and truth.
- **Think Critically & Innovate**
 - Generate new ideas, make informed decisions, draw conclusions, and solve problems.

Science Transfer Goals:

- **Inquire**
 - Engage in scientific and engineering practices, individually and collaboratively, to design solutions and construct explanations supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
- **Problem solve**
 - Engage in the engineering/scientific design process by defining problems, designing and refining optimal solutions, and taking into account constraints or limitations that impact real-world situations.
- **Develop models**
 - Develop, evaluate and use models to communicate scientific phenomena.
- **Communicate**
 - Communicate the results of scientific investigations in multiple formats, using evidence to analyze observations and justify conclusions.

Standards

Science and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
 2. Developing and using models
 3. Planning and carrying out investigations
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4. Analyzing and interpreting data
 5. Using mathematics and computational thinking
 6. Constructing explanations (for science) and designing solutions (for engineering)
 7. Engaging in an argument from evidence
 8. Obtaining, evaluating, and communicating information

Standard/Strand: Physical Science

PS3 - Energy

PS3-2. Make observations to show that energy can be transferred from place to place by sound, light, heat, and electric energy

PS3-4. Apply scientific principles of energy and motion to test and refine a device that converts kinetic energy to electrical energy or uses stored energy to cause motion or produce light or sound.

Meaning

Enduring Understandings Students will understand that... • energy can be transferred from one place to another. • Transverse and longitudinal waves change a sound wave's amplitude, volume, and pitch.	Essential Questions Students will keep considering... • wave properties and how waves transfer energy. • Factors that affect pitch.
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Acquisition of Knowledge & Skills
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Knowledge Students will know... • energy can be transferred in various ways and between objects. • all waves carry energy from one location to another location, and many waves are caused by a disturbance that travels through a medium • Disturbance of waves can be both perpendicular and parallel to the direction of the wave. • sound moves more quickly through liquids than it does through gasses. • frequency is closely related to pitch.	Skills Students will be able to... • Explain how energy can be transferred from place to place by waves, which can make objects move. • Develop a model of transverse and longitudinal waves. • Explain the properties of sound.
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- **Key Vocabulary:** amplitude, frequency, pitch, sound, sound wave, vibrate, wavelength

UNIT 9: LIGHT AND COMMUNICATION

Stage 1 – Desired Results

Transfer Goal(s)

Students will independently be able to use their learning to...

Foundational Transfer Goals:

- **Demonstrate Character**
 - Build positive relationships and make responsible choices that are physically, socially, emotionally, and intellectually sound.
- **Exhibit Resilience**
 - Persevere when facing challenges and taking risks.
- **Communicate & Collaborate**
 - Express ideas in a variety of ways and work responsibly with others.
- **Embrace Curiosity**
 - Investigate to seek knowledge and truth.

Science Transfer Goals:

- **Inquire**
 - Engage in scientific and engineering practices, individually and collaboratively, to design solutions and construct explanations supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
- **Problem solve**
 - Engage in the engineering/scientific design process by defining problems, designing and refining optimal solutions, and taking into account constraints or limitations that impact real-world situations.
- **Develop models**
 - Develop, evaluate and use models to communicate scientific phenomena.
- **Communicate**
 - Communicate the results of scientific investigations in multiple formats, using evidence to analyze observations and justify conclusions.
- **Make informed decisions**
 - Utilize scientific knowledge to make informed decisions as they relate to and impact the natural environment and society.

Standards

Science and Engineering Practices

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in an argument from evidence
8. Obtaining, evaluating, and communicating information

Standard/Strand: Physical Science**PS3. Energy**

PS3-2. Make observations to show that energy can be transferred from place to place by sound, light, heat, and electric currents.

PS3-4. Apply scientific principles of energy and motion to test and refine a device that converts kinetic energy to electrical energy or uses stored energy to cause motion or produce light or sound.*

PS4-2. Develop a model to describe that light must reflect off an object and enter the eye for the object to be seen.

PS4. Waves and their Applications in Technologies for Information Transfer

PS4-3. Develop and compare multiple ways to transfer information through encoding, sending, receiving, and decoding a pattern.*

Standard/Strand: Technology/Engineering**ETS1. Engineering Design**

ETS1-3. Plan and carry out tests of one or more design features of a given model or prototype in which variables are controlled and failure points are considered to identify which features need to be improved. Apply the results of tests to redesign a model or prototype.*

ETS1-5(MA). Evaluate relevant design features that must be considered in building a model or prototype of a solution to a given design problem.*

Meaning	
Enduring Understandings Students will understand that...	Essential Questions Students will keep considering...

- Information can be transferred by different technologies using patterns of sound, light, or numbers to transmit information.

- How can patterns of 1s and 0s can be used to transfer information about a picture?
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Acquisition of Knowledge & Skills

Knowledge

Students will know...

- Patterns are things that happen in a regular and repeated way, and there are different ways to use patterns to send information over a distance.
- Both light and sound are commonly used in forms of communication.
- **Key vocabulary** - code, communicate, decode, digital, encode, light, reflect, signal, transmit

Skills

Students will be able to...

- Explain how patterns (light, sound, numbers, etc.) can be used to communicate information over a distance.
- Develop different solutions that use patterns of light and sound to transfer information.
- Compare different communication solutions, identifying which solutions are more effective than others.