

Curriculum Map: Next Generation Science Grade 4 2020

Course: SCIENCE/HLTH 4 Sub-topic: General

Grade(s): None specified

Course

Description:

The performance expectations in fourth grade help students formulate answers to questions such as: "What are waves and what are some things they can do? How can water, ice, wind and vegetation change the land? What patterns of Earth's features can be determined with the use of maps? How do internal and external structures support the survival, growth, behavior, and reproduction of plants and animals? What is energy and how is it related to motion? How is energy transferred? How can energy be used to solve a problem?" Fourth grade performance expectations include PS3, PS4, LS1, ESS1, ESS2, ESS3, and ETS1 Disciplinary Core Ideas from the NRC Framework. Students are able to use a model of waves to describe patterns of waves in terms of amplitude and wavelength, and that waves can cause objects to move. Students are expected to develop understanding of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. They apply their knowledge of natural Earth processes to generate and compare multiple solutions to reduce the impacts of such processes on humans. In order to describe patterns of Earth's features, students analyze and interpret data from maps. Fourth graders are expected to develop an understanding that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. By developing a model, they describe that an object can be seen when light reflected from its surface enters the eye. Students are able to use evidence to construct an explanation of the relationship between the speed of an object and the energy of that object. Students are expected to develop an understanding that energy can be transferred from place to place by sound, light, heat, and electric currents or from object to object through collisions. They apply their understanding of energy to design, test, and refine a device that converts energy from one form to another. The crosscutting concepts of patterns; cause and effect; energy and matter; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the fourth grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

Unit: Physical Science - Energy and Waves

Skills:

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

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

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

4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

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. [Clarification Statement: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.]

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.* [Clarification Statement: Examples of solutions could include drums sending coded information]

Essential Questions:

- How can one explain the structure, properties, and interactions of matter?
- How can one explain and predict interactions between objects within systems?
- How is energy transferred and conserved?
- How are waves used to transfer energy and information?

Vocabulary:

- attract
- collision
- friction
- gravity
- magnets
- repel
- conductor
- electricity
- insulator
- parallel circuit
- serial circuit
- system
- closed circuit
- open circuit
- switch
- current
- electromagnet
- forces
- push
- pull
- energy
- magnet
- transfer
- motion
- electric current
- heat
- light
- sound
- transformation
- energy conversion

non-renewable energy
renewable energy
battery
stored energy
waves
amplitude
wavelength
earthquake
seismic waves
reflection
refraction
color
decode
digitized
encode
pixels
transmit

STANDARDS: STANDARDS

STATE: Pennsylvania State Anchors (2010)

S4.A.1.1 (Advanced) Identify and explain the application of scientific, environmental, or technological knowledge to possible solutions to problems.

S4.A.1.3.1 (Advanced) Observe and record change by using time and measurement.

S4.A.2.1.3 (Advanced) Observe a natural phenomenon (e.g., weather changes, length of daylight/night, movement of shadows, animal migrations, growth of plants), record observations, and then make a prediction based on those observations.

S4.A.2.1.4 (Advanced) State a conclusion that is consistent with the information/data.

S4.C.1.1.1 (Advanced) Use physical properties [e.g., mass, shape, size, volume, color, texture, magnetism, state (i.e., solid, liquid, and gas), conductivity (i.e., electrical and heat)] to describe matter.

S4.C.2.1 (Advanced) Recognize basic energy types and sources, or describe how energy can be changed from one form to another.

S4.C.2.1.1 (Advanced) Identify energy forms, energy transfer, and energy examples (e.g., light, heat, electrical).

S4.C.2.1.3 (Advanced) Recognize or illustrate simple direct current series and parallel circuits composed of batteries, light bulbs (or other common loads), wire, and on/off switches.

S4.C.3.1 (Advanced) Identify and describe different types of force and motion resulting from these forces, or the effect of the interaction between force and motion.

Topic: Lesson 1 Energy
Minutes for Topic: 45

Core Lesson Description: When objects touch or collide, they push on one another and can change motion or shape. Magnets create a magnetic field that can exert an attracting or repelling force on other objects that can affect motion.

Core Lesson Student Learning Objectives: Students will investigate the forces between two or more magnets to identify patterns.

Core Lesson Essential Questions: How can one explain and predict interactions between objects within systems?

Core Lesson Big Ideas: Interactions between any two objects can cause changes in one or both.

Core Lesson Key Terminology & Definitions: attract
collision
friction
gravity
magnets
repel

Topic: Lesson 2 Energy

Minutes for Topic: 45

Core Lesson Description: Magnets create a magnetic field that can exert an attracting or repelling force on other objects that can affect motion.

Core Lesson Student Learning Objectives: Students will investigate the push and pull forces between objects not in contact with one another.

Core Lesson Essential Questions: How can one explain and predict interactions between objects within systems?

Core Lesson Big Ideas: Interactions between any two objects can cause changes in one or both.

Core Lesson Key Terminology & Definitions: attract
collision
magnets
repel

Topic: Lesson 3 Energy

Minutes for Topic: 45

Core Lesson Description: When objects touch or collide, they push on one another and can change motion or shape. Magnets create a magnetic field that can exert an attracting or repelling force on other objects that can affect motion.

Core Lesson Student Learning Objectives: Students will design and refine solutions to a problem by using magnets to move objects not in contact with one another.

Core Lesson Essential Questions: How can one explain and predict interactions between objects within systems?

Core Lesson Big Ideas: Interactions between any two objects can cause changes in one or both.

Core Lesson Key Terminology & Definitions: attract
collision
magnets
repel

Topic: Lesson 4 Energy

Minutes for Topic: 45

Core Lesson Description: Materials that allow electricity to flow are conductors; those that do not are insulators.

Core Lesson Student Learning Objectives: Students will investigate and describe conductors and insulators.

Core Lesson Essential Questions: How can one explain and predict interactions between objects within systems?

Core Lesson Big Ideas: Interactions between any two objects can cause changes in one or both.

Core Lesson Key Terminology & Definitions: conductor
electricity
insulator

Topic: Lesson 5 Energy

Minutes for Topic: 45

Core Lesson Description: Electrical circuits require a complete loop through which an electrical current can pass.

Core Lesson Student Learning Objectives: Students will construct serial and parallel circuits and describe the path of electrons in the circuit.

Core Lesson Essential Questions: How can one explain and predict interactions between objects within systems?

Core Lesson Big Ideas: Interactions between any two objects can cause changes in one or both.

Core Lesson Key Terminology & Definitions: parallel circuit
serial circuit
system

Topic: Lesson 6 Energy

Core Lesson Description: An open circuit is an incomplete electric pathway; a closed circuit is a complete pathway.

Core Lesson Student Learning Objectives: Students will demonstrate and explain open and closed circuits utilizing switches.

Core Lesson Essential Questions: How can one explain and predict interactions between objects within systems?

Core Lesson Big Ideas: Interactions between any two objects can cause change in one or both.

Core Lesson Key Terminology & Definitions: closed circuit
open circuit
switch
system

Topic: Lesson 7 Energy

Core Lesson Description: A core of iron or steel becomes an electromagnet when electricity flows through a coil of insulated wire surrounding it.

Core Lesson Student Learning Objectives: Students will construct an electromagnet and plan an investigation to determine how one can make the electromagnet stronger and weaker.

Core Lesson Essential Questions: How can one explain and predict interactions between objects within systems?

Core Lesson Big Ideas: Interactions between any two objects can cause changes in one or both.

Core Lesson Key Terminology & Definitions: current
electromagnet
system

Topic: Lesson 8 Energy

Core Lesson Description: Electromagnetic forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects.

Core Lesson Student Learning Objectives: Students will plan and carry out an investigation to determine factors that affect the strength of electric and magnetic forces.

Core Lesson Essential Questions: How can one explain and predict interactions between objects within systems?

Core Lesson Big Ideas: Interactions between any two objects can cause changes in one or both.

Core Lesson Key Terminology & Definitions: current
electromagnetic forces

Topic: Lesson 9 Energy

Core Lesson Description: A system can appear to be unchanging when processes within the system are going on at opposite but equal rates (e.g. water behind a dam is at a constant height because water is flowing in at the same rate that water is flowing out).

Core Lesson Student Learning Objectives: Students will construct an explanation using data why an object subjected to multiple pushes and pulls might stay in one place or move.

Core Lesson Essential Questions: How can one explain and predict interactions between objects within systems?

Core Lesson Big Ideas: Interactions between any two objects can cause changes in one or both.

Core Lesson Key Terminology & Definitions: systems

Topic: Lesson 10 Energy

Core Lesson Description: Magnets can exert forces on other magnets or on materials, causing energy transfer between them (e.g. leading to changes in motion) even when the objects are not touching.

Core Lesson Student Learning Objectives: Students will demonstrate the energy transfer between two objects using a magnet and another object.

Core Lesson Essential Questions: How is energy transferred and conserved?

Core Lesson Big Ideas: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

Core Lesson Key Terminology & Definitions: energy
transfer
magnet

force

Topic: Lesson 11 Energy

Core Lesson Description: The faster a given object is moving, the more energy it possesses.

Core Lesson Student Learning Objectives: Students will use evidence to construct an explanation for the relationship between speed, energy, and motion.

Core Lesson Essential Questions: How is energy transferred and conserved?

Core Lesson Big Ideas: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

Core Lesson Key Terminology & Definitions: energy
motion

Topic: Lesson 12 Energy

Core Lesson Description: Energy can be moved from place to place by moving objects or through sound, light, or electric currents.

Core Lesson Student Learning Objectives: Students will carry out investigations to provide evidence that energy is transferred from place to place by sound, light, heat, electric currents, interacting magnets, and moving or colliding objects.

Core Lesson Essential Questions: How is energy transferred and conserved?

Core Lesson Big Ideas: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

Core Lesson Key Terminology & Definitions: collision
electric current
energy
heat
light
magnets
sound
transformation

Topic: Lesson 13 Energy

Core Lesson Description: Energy can be moved from place to place by moving objects or through sound, light, or electric currents.

Core Lesson Student Learning Objectives: Students will obtain and communicate information for how technology allows humans to concentrate, transport, and store energy for practical use.

Core Lesson Essential Questions: How is energy transferred and conserved?

Core Lesson Big Ideas: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

Core Lesson Key Terminology & Definitions: electric current
energy
light
sound

Topic: Lesson 14 Energy

Core Lesson Description: Energy can be moved from place to place by moving objects or through sound, light, or electric currents.

Core Lesson Student Learning Objectives: Students will design and construct a device that converts energy from one form to another using given design criteria.

Core Lesson Essential Questions: How is energy transferred and conserved?

Core Lesson Big Ideas: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

Core Lesson Key Terminology & Definitions: electric current
energy
energy conversion
light
sound

Topic: Lesson 15 Energy

Core Lesson Description: Energy can be moved from place to place by moving objects or through sound, light, or electric currents.

Core Lesson Student Learning Objectives: Students will design and test a solution to a problem that utilizes the transfer of electric energy in the solution using given design constraints.

Core Lesson Essential Questions: How is energy transferred and conserved?

Core Lesson Big Ideas: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

Core Lesson Key electric current

Terminology & Definitions: energy
light
sound
transfer

Topic: Lesson 16 Energy

Core Lesson Description: 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.

Core Lesson Student Learning Objectives: Students will develop a model using examples to explain differences between renewable and non-renewable sources of energy.

Core Lesson Essential Questions: How is energy transferred and conserved?

Core Lesson Big Ideas: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

Core Lesson Key Terminology & Definitions: electric current
light
non-renewable energy
renewable energy
sound

Topic: Lesson 17 Energy

Core Lesson Description: Energy can be moved from place to place by moving objects or through sound, light, or electric currents.

Core Lesson Student Learning Objectives: Students will carry out investigations to provide evidence that energy is transferred from place to place by sound, light, heat, electric currents, interacting magnets, and moving or colliding objects.

Core Lesson Essential Questions: How is energy transferred and conserved?

Core Lesson Big Ideas: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

Core Lesson Key Terminology & Definitions: collision
electric current
energy transfer
light
magnet
sound

Topic: Lesson 18 Energy

Core Lesson Description: Energy can be moved from place to place by moving objects or through sound, light, or electric currents.

Core Lesson Student Learning Objectives: Students will make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electrical currents.

Core Lesson Essential Questions: How is energy transferred and conserved?

Core Lesson Big Ideas: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

Core Lesson Key Terminology & Definitions: electric current
energy
transfer
light
sound

Topic: Lesson 19 Energy

Core Lesson Description: Energy is present whenever there are moving objects, sound, light, or heat.

Core Lesson Student Learning Objectives: Students will construct an explanation for the relationship between energy and motion.

Core Lesson Essential Questions: How is energy transferred and conserved?

Core Lesson Big Ideas: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

Core Lesson Key Terminology & Definitions: energy
light
sound

Topic: Lesson 20 Energy

Core Lesson Description: 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.

Core Lesson Student Learning Objectives: Students will construct an investigation to demonstrate the relationship between energy and motion.

Core Lesson Essential Questions: How is energy transferred and conserved?

Core Lesson Big Ideas: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

Topic: Lesson 21 Energy

Core Lesson Description: When objects collide, the contact forces transfer energy so as to change the motion of each object.

Core Lesson Student Learning Objectives: Students will ask questions and predict outcomes about the changes in energy that occur when objects collide.

Core Lesson Essential Questions: How is energy transferred and conserved?

Core Lesson Big Ideas: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

Core Lesson Key Terminology & Definitions: collision
energy
energy transfer
force
motion

Topic: Lesson 22 Energy

Core Lesson Description: The expression "produce energy" typically refers to the conversion of store energy into a desired form for practical use. It is important to be able to concentrate energy so that it is available for use where and when it is needed (e.g. batteries).

Core Lesson Student Learning Objectives: Students will obtain and communicate information explaining how technology allows humans to concentrate, transport, and store energy for practical use.

Core Lesson Essential Questions: How is energy transferred and conserved?

Core Lesson Big Ideas: Interactions of objects or systems of objects can be predicted and explained using the concept of energy transfer and conservation.

Core Lesson Key Terminology & Definitions: battery
conversion
energy
production
stored energy

Topic: Lesson 23 Waves

Core Lesson Description: Waves are regular patterns of motion, and 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; it does not move horizontally.

Core Lesson Student Learning Objectives: Students will identify the patterns of waves by observing their motion in water.

Core Lesson Essential Questions: How are waves used to transfer energy and information?

Core Lesson Big Ideas: Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter.

Core Lesson Key Terminology & Definitions: energy
information
motion
waves

Topic: Lesson 24 Waves

Core Lesson Description: Waves are regular patterns of motion, and 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; it does not move horizontally.

Core Lesson Student Learning Objectives: Students will provide evidence that waves transfer energy to objects as a wave passes.

Core Lesson Essential Questions: How are waves used to transfer energy and information?

Core Lesson Big Ideas: Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter.

Core Lesson Key Terminology & Definitions: energy transfer
information
motion
waves

Topic: Lesson 25 Waves

Core Lesson Description: 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; it does not move in the direction of the wave - observe, for example, a bobbing cork or seabird- except when the water meets the beach.

Core Lesson Student Learning Objectives: Students will plan data collection methods and make observations to provide evidence that waves transfer energy to objects.

Core Lesson Essential Questions: How are waves used to transfer energy and information?

Core Lesson Big Ideas: Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter.

Core Lesson Key Terminology & Definitions: energy transfer
waves

Topic: Lesson 26 Waves

Core Lesson Description: Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks).

Core Lesson Student Learning Objectives: Students will use a model to describe the amplitude and wavelength of waves.

Core Lesson Essential Questions: How are waves used to transfer energy and information?

Core Lesson Big Ideas: Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter.

Core Lesson Key Terminology & Definitions: amplitude
wavelength
waves

Topic: Lesson 27 Waves

Core Lesson Description: Earthquakes cause seismic waves, which are waves of motion in the Earth's crust.

Core Lesson Student Learning Objectives: Students will describe how similar seismic waves are to other types of waves.

Core Lesson Essential Questions: How are waves used to transfer energy and information?

Core Lesson Big Ideas: Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter.

Core Lesson Key Terminology & Definitions: earthquake
seismic waves

Topic: Lesson 28 Waves

Core Lesson Description: An object can be seen when light reflected from its surface enters the eye.

Core Lesson Student Learning Objectives: Students will investigate and provide evidence that the color people see depends on the color of the available light sources as well as the properties of the surface of the object reflecting the light.

Core Lesson

Essential Questions: How are waves used to transfer energy and information?

Core Lesson Big Ideas: Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter.

Core Lesson Key Terminology & Definitions: reflection
refraction

Topic: Lesson 29 Waves

Core Lesson Description: The color people see depends on the color of the available light sources as well as the properties of the surface.

Core Lesson Student Learning Objectives: Students will investigate and provide evidence that the color people see depends on the color of the available light sources as well as the properties of the surface of the object reflecting the light.

Core Lesson Essential Questions: How are waves used to transfer energy and information?

Core Lesson Big Ideas: Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter.

Core Lesson Key Terminology & Definitions: color
reflection

Topic: Lesson 30 Waves

Core Lesson Description: Digitized information (e.g. the pixels of a picture) can be stored for future recovery or 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 form to voice-and vice versa.

Core Lesson Student Learning Objectives: Students will obtain and communicate information about modern devices that are used to transmit and receive digital information.

Core Lesson Essential Questions: How are waves used to transfer energy and information?

Core Lesson Big Ideas: Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter.

Core Lesson Key Terminology & Definitions: decode
digitized information
encode
pixels
transmit

Unit:

This Curriculum Map Unit has no Topics to display

Unit: Life Science

Timeline: 4 Weeks

Description: February - March

Essential Questions: How do organisms live, grow, respond to their environment, and reproduce?

How and why do organisms interact with their environment and what are the effects of these interactions?

How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms?

Vocabulary: behaviors
cause and effect
function
offspring
reproduce
structure
survival
system
system models

STANDARDS: STANDARDS

STATE: Pennsylvania State Anchors (2010)

[S4.B.1.1.5](#)
(Advanced)

Describe the life cycles of different organisms (e.g., moth, grasshopper, frog, seed-producing plant).

Topic: Lesson 1

Core Lesson Description: Plants and animals have internal and external structures that serve various functions to survive.

Core Lesson Student Learning Objectives: Students will construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Core Lesson Essential Questions: How do organisms live, grow, respond to their environment, and reproduce?

Core Lesson Big Ideas: All organisms are made of cells and can be characterized by common aspects of their structure and functioning.

Core Lesson Key behaviors

Terminology & Definitions: cause and effect
function
offspring
reproduce
structure
survival
system
system models

Topic: Lesson 2

Core Lesson Essential Questions: How do organisms live, grow, respond to their environment, and reproduce?

Core Lesson Big Ideas: All organisms are made of cells and can be characterized by common aspects of their structure and functioning.

Topic: Lesson 3

Core Lesson Essential Questions: How and why do organisms interact with their environment and what are the effects of these interactions?

Core Lesson Big Ideas: Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.

Topic: Lesson 4

Core Lesson Essential Questions: How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms?

Core Lesson Big Ideas: Biological evolution explains both the unity and diversity of species and provides a unifying principle for the history and diversity of life on Earth.

Unit: Earth and Space Science

Timeline: 11 Weeks

Description: March - June

Essential Questions: What is the universe, and what is Earth's place in it?
How and why is Earth constantly changing?
How do Earth's processes and human activities affect each other?

Vocabulary: fossils
rock
formations

deposition
erosion
vegetation
weathering
physical characteristics
biogeology
earthquake
geographic
geologic
hazards
mountain range
natural
plate tectonics
trench
volcano
analyze
features
interpret
lakes
lentic
lotic
ponds
rivers
streams
watersheds
erosion
fossil
landform
organism
minerals
rock layers
dams
fissile materials
fossil fuels
solar
tsunami
weather

volcanic eruptions

STANDARDS: STANDARDS

STATE: Pennsylvania State Anchors (2010)

- [S4.A.1.1 \(Advanced\)](#) Identify and explain the application of scientific, environmental, or technological knowledge to possible solutions to problems.
- [S4.A.1.3 \(Advanced\)](#) Recognize and describe change in natural or human-made systems and the possible effects of those changes.
- [S4.A.2.1 \(Advanced\)](#) Apply skills necessary to conduct an experiment or design a solution to solve a problem.
- [S4.A.2.2 \(Advanced\)](#) Identify appropriate instruments for a specific task and describe the information the instrument can provide.
- [S4.A.3.1 \(Advanced\)](#) Identify systems and describe relationships among parts of a familiar system (e.g., digestive system, simple machines, water cycle).
- [S4.A.3.2 \(Advanced\)](#) Use models to illustrate simple concepts and compare the models to what they represent.
- [S4.A.3.3 \(Advanced\)](#) Identify and make observations about patterns that regularly occur and reoccur in nature.
- [S4.D.1.1 \(Advanced\)](#) Describe basic landforms in Pennsylvania.
- [S4.D.1.1.1 \(Advanced\)](#) Describe how prominent Earth features in Pennsylvania (e.g., mountains, valleys, caves, sinkholes, lakes, rivers) were formed.
- [S4.D.1.1.2 \(Advanced\)](#) Identify various Earth structures (e.g., mountains, watersheds, peninsulas, lakes, rivers, valleys) through the use of models.
- [S4.D.1.1.3 \(Advanced\)](#) Describe the composition of soil as weathered rock and decomposed organic remains.
- [S4.D.1.2.3 \(Advanced\)](#) Recognize ways that humans benefit from the use of water resources (e.g., agriculture, energy, recreation).

Topic: Lesson 1

Core Lesson Essential Questions: What is the universe, and what is Earth's place in it?

Core Lesson Big Ideas: The universe is composed of a variety of different objects, which are organized into systems each of, which develops according to accepted physical processes and laws.

Topic: Lesson 2

Core Lesson Description: Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed.

Core Lesson Student Learning Objectives: Students will identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

Core Lesson Essential Questions: How and why is Earth constantly changing?

Core Lesson Big Ideas: The Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales.

Core Lesson Key Terminology & Definitions: fossils
rock
formations

Topic: Lesson 3

Core Lesson Description: 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.

Core Lesson Student Learning Objectives: Students will make observations and measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation (heating, cooling, volume of water, speed of wind, deposition, slope, angles, etc.).

Core Lesson Essential Questions: How and why is Earth constantly changing?

Core Lesson Big Ideas: The Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales.

Core Lesson Key Terminology & Definitions: deposition
erosion
vegetation
weathering

Topic: Lesson 4

Core Lesson Description: Living things affect the physical characteristics of their regions.

Core Lesson Student Learning Objectives: Students will make observations and document how living things affect the physical characteristics in different regions.

Core Lesson Essential Questions: How and why is the Earth constantly changing?

Core Lesson Big Ideas: The Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales.

Core Lesson Key Terminology & Definitions: physical characteristics

Topic: Lesson 5

Core Lesson Description: The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns.

Core Lesson

Student Learning Objectives: Students will analyze and interpret data from maps to describe patterns of Earth's features.

Core Lesson Essential Questions: How and why is Earth constantly changing?

Core Lesson Big Ideas: The Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales.

Core Lesson Key Terminology & Definitions: biogeology
earthquake
geographic
geologic
hazards
mountain range
natural
plate tectonics
trench
volcano

Topic: Lesson 6

Core Lesson Description: The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns.

Core Lesson Student Learning Objectives: Students will analyze and interpret data from maps to describe Earth's features (e.g. mountains, valleys, caves, sinkholes, lakes, rivers, peninsulas, lentic/lotic water systems, ,etc.).

Core Lesson Essential Questions: How and why is the Earth constantly changing?

Core Lesson Big Ideas: The Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales.

Core Lesson Key Terminology & Definitions: analyze
features
interpret

Topic: Lesson 7

Core Lesson Description: Water occurs underground, above ground, and in the atmosphere.

Core Lesson Student Learning Objectives: Students will identify various types of water environments in Pennsylvania.

Core Lesson Essential Questions: How and why is Earth constantly changing?

Core Lesson Big Ideas: The Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales.

Core Lesson Key Terminology & Definitions: lakes
lentic
lotic
ponds
rivers
streams
watersheds

Topic: Lesson 8

Core Lesson Description: Many types of rocks and minerals are formed from the remains of organisms or are altered by their activities.

Core Lesson Student Learning Objectives: Students will use fossils as evidence to infer that some rocks were formed from the remains of once living organisms.

Core Lesson Essential Questions: How and why is Earth constantly changing?

Core Lesson Big Ideas: The Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales.

Core Lesson Key Terminology & Definitions: erosion
fossil
landform
organism

Topic: Lesson 9

Core Lesson Description: The presence and location of certain fossil types indicate the order in which rock layers were formed.

Core Lesson Student Learning Objectives: Students will use evidence from patterns in rock formations and fossils in rock layers to support the explanation for a change in landforms and environments over time.

Core Lesson Essential Questions: How and why is Earth constantly changing?

Core Lesson Big Ideas: The Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales.

Core Lesson Key Terminology & Definitions: minerals
rock layers

Topic: Lesson 10

Core Lesson Description: Energy that humans use is derived from multiple natural resources and their use affects the environment in many ways.

Core Lesson Student Learning Objectives: Students will research multiple sources to describe ways that energy and fuels are derived from natural resources and their impact.

Core Lesson Essential Questions: How do Earth's processes and human activities affect each other?

Core Lesson Big Ideas: The Earth's processes affect and are affected by human activities.

Core Lesson Key Terminology & Definitions: dams
fissile materials
fossil fuels
natural resources
solar

Topic: Lesson 11

Core Lesson Description: A variety of hazards result from natural processes (e.g. earthquakes, tsunamis, etc.). Humans cannot eliminate the hazards, but can take steps to reduce the impact.

Core Lesson Student Learning Objectives: Students will generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

Core Lesson Essential Questions: How do Earth's processes and human activities affect each other?

Core Lesson Big Ideas: The Earth's processes affect and are affected by human activities.

Core Lesson Key Terminology & Definitions: earthquakes
natural hazards
tsunamis
volcanic eruptions
weather