Grade Four Earth Science

Theme ***Interconnections Within Systems***

This theme focuses on helping students recognize the components of various systems and then investigate dynamic and sustainable relationships within systems using scientific inquiry.

Strand Connection

Heat and electrical energy are forms of energy that can be transferred from one location to another. Matter has properties that allow the transfer of heat and electrical energy. Heating and cooling affect the weathering of Earth's surface and Earth's past environments. The processes that shape Earth's surface and the fossil evidence found can help decode Earth's history.

Science Inquiry and Applications:

During the years of PreK-4, all students must become proficient in the use of the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

- Observe and ask questions about the natural environment
- Plan and conduct simple investigations
- Employ simple equipment and tools to gather data and extend the senses
- Use appropriate mathematics with data to construct reasonable explanations
- Communicate about observations, investigations, and explanations
- Review and ask questions about the observations and explanations of others

Topic ***Earth's Surface***

This topic focuses on the variety of processes that shape and reshape Earth's surface

Pacing

10-15 classes at 45 minutes per class

Content Statement

1. Earth's surface has specific characteristics and landforms that can be identified.

About 70 percent of the Earth's surface is covered with water and most of that is the ocean. Only a small portion of the Earth's water is freshwater, which is found in rivers, lakes, and ground water.

Earth's surface can change due to erosion and deposition of soil, rock, or sediment. Catastrophic events such as flooding, volcanoes, and earthquakes can create landforms.

Learning Targets:

- I can compare the amount of land to the amount of water on the Earth's surface.
- I can contrast the amount of fresh water to salt water on the planet.
- I can evaluate how the Earth's surface has changed (e.g., erosion,

Content Elaborations

Prior Concepts Related to Earth's Surface

PreK-2: Wind and precipitation can be measured, water can change state, heating and freezing can change the properties of materials, and living things can cause changes on Earth.

Grades 3: The composition and characteristics of rocks and soil are studied.

Grade 4 Concepts

Earth is known as the Blue Planet because about 70 percent of Earth's surface is covered in water. Freshwater is a small percentage of the overall water found on Earth; the majority is oceanic.

There are many different processes that continually build up or tear down the surface of Earth. These processes include erosion, deposition, volcanic activity, earthquakes, glacial movement, and weathering.

deposition, volcanic activity, earthquakes, glacier movement, and weathering). **Note**: This is not plate tectonics but processes that change the earth over relatively short amounts of time—minutes to thousands of years. • I can construct model landforms using Earth's processes. • I can illustrate vocabulary related to common landforms or features.	Beginning to recognize common landforms or features through field investigations, field trips, topographic maps, remote sensing data, aerial photographs, physical geography maps, and /or photographs (through books or virtually) are important ways to understand the formation of landforms and features. Common landforms and features include streams, deltas, floodplains, hills, mountains/mount ranges, valleys, sinkholes, caves, canyons, glacial features, dunes, springs, volcanoes, and islands. Connecting the processes that must occur to the resulting landform, feature, or characteristic should be emphasized. This can be demonstrated through experiments, investigations (including virtual experiences) or field observations. Technology can help illustrate specific features that are not found locally or demonstrate change that occurred (e.g., using satellite photos of an erosion event such as flooding). ***Future Application of Concepts*** Grade 5: Earth is a planet in the solar system that has a unique composition. Global seasonal changes are introduced, including monsoons and rainy seasons, which can change erosion and deposition patterns. Grades 6-8: Changes in the surface of Earth are examined using data from the rock record and through the understanding of plate tectonics and the interior of Earth. Historical studies of erosion and deposition patterns are introduced, in addition to soil conservation, the interaction of Earth's spheres, and ocean features specific to erosion and deposition.
Content Vocabulary • aerial photographs • canyons • catastrophic • caves • constructive • deltas • deposition • destructive • dunes • earthquakes • erosion • lakes • landforms/common landforms • mountains/mountain ranges • ocean • physical maps • precipitation • remote sensing data • rivers • rocks • sediment • sinkholes	**Academic Vocabulary** • change • characteristics • classification • compare • constructive • data • design • destructive • detect • dramatic • effect • explore • external • feature • formation • gradual • identify • interact • investigate • investigation • process • transfer

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flooding
floodplains
freshwater
glacial features
glacial movement
ground water
hills
islands
soil
springs
streams
topographic maps
valleys
volcanic activity
volcanoes and islands
weathering

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evidence
experiment
utilize

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Formative Assessments

Common Formative Assessments (CFAs)
Science journals
Labs
Exit slips
Categorize vocabulary into processes or features

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Summative Assessments

Topic projects
Test reflecting standards
Quizzes reflecting standards
Science journals
Labs

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Resources

Use LANDSAT data to research or locate specific major landforms such as topographic, aerial maps, or LANDSAT to locate specific landforms or geographical features (e.g., build and using a model and share with classmates)
Focus Books: http://www.focuscurriculum.com/
Gizmo (see 5th grade teachers): http://www.explorelearning.com/
StrataLogica: http://www.stratalogica.com/

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Enrichment Strategies

Gizmos (explorelearning.com) Activity C is often an extension for those that need a challenge
Focus Curriculum Leveled Reader Booklets...Above Level texts

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Integrations

ELA: recording information in journals, reading in content area
Math:
Social Studies: Content Statement 11: The regions which become known as the North, South, and West of the United States developed in the early 1800s largely based on their physical environments and economies. I can describe and compare the landforms, climates, populations, vegetation, and economic characteristics of places and regions in Ohio.

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Intervention Strategies

ELL - photographs
Front loading vocabulary/vocabulary cards
Reading A-Z: leveled text that students can read or listen to
Focus Curriculum
Foldables

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Grade Four Earth Science

Theme ***Interconnections Within Systems***

This theme focuses on helping students recognize the components of various systems and then investigate dynamic and sustainable relationships within systems using scientific inquiry.

Strand Connection

Heat and electrical energy are forms of energy that can be transferred from one location to another. Matter has properties that allow the transfer of heat and electrical energy. Heating and cooling affect the weathering of Earth's surface and Earth's past environments. The processes that shape Earth's surface and the fossil evidence found can help decode Earth's history.

Science Inquiry and Applications:

During the years of PreK-4, all students must become proficient in the use of the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

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Topic ***Earth's Surface***

This topic focuses on the variety of processes that shape and reshape Earth's surface.

Pacing

10-15 classes at 45 minutes per class

Content Statement

2. The surface of Earth changes due to weathering.

Rocks change shape, size, and/or form due to water or ice movement, freeze and thaw, wind, plant growth, gases in the air, pollution, and catastrophic events such as earthquakes, mass wasting, flooding, and volcanic activity.

Note: The ice movement (above) refers to large bodies of ice, such as glaciers that can break large rocks into small ones.

Learning Targets:

- I can compare how wind, water, and ice shape and reshape Earth's land surface.
- I can recognize the differences between fast and slow processes that shape Earth's surface.
- I can analyze the effects of weathering upon different types of rocks.

Content Elaborations

Prior Concepts Related to Earth's Surface

PreK-2: Wind is moving air, water and wind have measurable properties, water changes state, properties of materials change when exposed to various conditions (e.g., heating, freezing), and living organisms interact with their environment.

Grades 3: Rocks and soil have unique characteristics. Soil contains pieces of rock.

Grade 4 Concepts

Different types of rock weather at different rates due to specific characteristics of the rock and the exposure to weathering factors (e.g., freezing/thawing, wind, water). Weathering is defined as a group of processes that change rock at or near Earth's surface. Some weathering processes take a long time to occur, while some weathering processes occur quickly.

	The weathering process must be observed in nature, through classroom experimentation, or virtually. Seeing tree roots fracturing bedrock or the effect of years of precipitation on a marble statue can illustrate ways that rocks change shape over time. Investigations can include classroom simulations, laboratory testing, and field observations. ***Future Application of Concepts*** Grade 5: Earth is a planet in the solar system that has a unique composition; global seasonal changes and patterns are introduced, including temperature fluctuations/ranges, monsoons, and/or rainy seasons which can impact the weathering of Earth's surface. Grades 6-8: The relationship between the characteristics of rocks and the environment in which they form is explored as well as how rocks break down (weather) and are transported (erosion), water flows through rock and soil at different rates, and the causes of changes on Earth's surface.
Content Vocabulary • bedrock • catastrophic events • earthquakes • erosion • flooding • fracturing • freeze • gases in the air • glacier • ice • mass wasting • organisms • plant growth • pollution • thaw • volcanic • water • weathering • wind	**Academic Vocabulary** • change • characteristics • classification • compare • constructive • data • design • destructive • detect • dramatic • effect • evidence • experiment • explore • external • feature • formation • gradual • identify • interact • investigate • investigation • process • transfer • utilize
Formative Assessments • Common Formative Assessments (CFAs) • Science journals • Labs • Exit slips	**Summative Assessments** • Topic projects • Test reflecting standards • Quizzes reflecting standards • Science journals • Labs

Resources • Focus Books: http://www.focuscurriculum.com/ • Gizmo (see 5th grade teachers): http://www.explorelearning.com/ • Science A-Z: http://www.sciencea-z.com	**Enrichment Strategies** • Gizmos (explorelearning.com) Activity C is often an extension for those that need a challenge • Focus Curriculum Leveled Reader Booklets...Above Level texts
Integrations • **ELA**: recording information in journals, reading in content area • **Math**: • **Social Studies**: Landforms	**Intervention Strategies** • Front loading vocabulary/vocabulary cards • Reading A-Z: leveled text that students can read or listen to • Focus Curriculum • Foldables

Grade Four Earth Science

Theme ***Interconnections Within Systems***

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Strand Connection

Heat and electrical energy are forms of energy that can be transferred from one location to another. Matter has properties that allow the transfer of heat and electrical energy. Heating and cooling affect the weathering of Earth's surface and Earth's past environments. The processes that shape Earth's surface and the fossil evidence found can help decode Earth's history.

Science Inquiry and Applications:

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Topic ***Earth's Surface***

This topic focuses on the variety of processes that shape and reshape Earth's surface

Pacing

5-7 classes at 45 minutes per class

Content Statement

3. The surface of Earth changes due to erosion and deposition.

Water, wind, and ice physically remove and carry (erosion) rock, soil, and sediment and deposit the material in a new location.

Gravitational force affects movements of water, rock, and soil.

Learning Targets:

- I can illustrate the movement of sediment.
- I can compare destructive (erosion) and constructive (deposition) processes that change the Earth's surface.
- I can predict gravity's impact on the movement of sediment.

Content Elaborations

Prior Concepts Related to Earth's Surface

PreK-2: Wind is moving air, water and wind have measurable properties, water changes state, forces change the motion of an object, and some forces act without touching (e.g., gravitational forces).

Grades 3: Soil and rock have unique characteristics. Soil and rock are nonliving resources that can be conserved.

Grade 4 Concepts

Erosion is a process that transports rock, soil, or sediment to a different location. Weathering is the breakdown of large rock into smaller pieces of rock. Erosion is what carries the weathered material to a new location. Gravity plays an important role in understanding erosion, especially catastrophic events like mass wasting (e.g., mudslides, avalanches, landslides) or flooding.

	Erosion is a "destructive" process and deposition is a constructive" process. Erosion and deposition directly contribute to landforms and features formation that are included in grade 4. Topographic maps and aerial photographs can be used to locate erosional and depositional areas in Ohio. Surficial geology maps also can illustrate the patterns of glacial erosion and deposition that have occurred. Field trips and field investigations (may be virtual) are recommended as erosional and depositional features that can be seen locally or within the state can help to connect the concept of erosion and deposition to the real world. ***Future Application of Concepts*** Grade 5: Earth is a planet in the solar system that has a unique composition; global seasonal changes are introduced, including monsoons and rainy seasons which can change erosion and deposition patterns. Grades 6-8: Historical studies of erosional and depositional patterns are introduced in addition to soil conservation, the interaction of Earth's spheres, ocean features specific to erosion and deposition, and plate tectonics.
Content Vocabulary • aerial photos • avalanche • deposition • erosion • flooding • glacier • gravity • landslide • mass wasting • rocks • sediment • soil • topographic maps • weathering	**Academic Vocabulary** • change • characteristics • classification • compare • constructive • data • design • destructive • detect • dramatic • effect • evidence • experiment • explore • external • feature • formation • gradual • identify • interact • investigate • investigation • process • transfer • utilize
Formative Assessments • Common Formative Assessments (CFAs) • Science journals	**Summative Assessments** • Topic projects • Test reflecting standards

• Labs • Exit slips	• Quizzes reflecting standards • Science journals • Labs
Resources • Focus Books: http://www.focuscurriculum.com/ • Gizmo (see 5th grade teachers): http://www.explorelearning.com/ • Science A-Z: http://www.sciencea-z.com	**Enrichment Strategies** • Gizmos (explorelearning.com) Activity C is often an extension for those that need a challenge • Focus Curriculum Leveled Reader Booklets...Above Level texts
Integrations • **ELA**: recording information in journals, reading in content area • **Math**: measurement • **Social Studies**:	**Intervention Strategies** • Front loading vocabulary/vocabulary cards • Reading A-Z: leveled text that students can read or listen to • Focus Curriculum • Foldables

Grade Four Life Science

Theme ***Interconnections Within Systems***

This theme focuses on helping students recognize the components of various systems and then investigate dynamic and sustainable relationships within systems using scientific inquiry.

Strand Connection

Heat and electrical energy are forms of energy that can be transferred from one location to another. Matter has properties that allow the transfer of heat and electrical energy. Heating and cooling affect the weathering of Earth's surface and Earth's past environments. The processes that shape Earth's surface and the fossil evidence found can help decode Earth's history.

Science Inquiry and Applications:

During the years of PreK-4, all students must become proficient in the use of the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

- Observe and ask questions about the natural environment
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- Use appropriate mathematics with data to construct reasonable explanations
- Communicate about observations, investigations, and explanations
- Review and ask questions about the observations and explanations of others

Topic ***Earth's Living History***

This topic focuses on using fossil evidence and living organisms to observe that suitable habitats depend upon a combination of biotic and abiotic factors.

Pacing

10-15 classes at 45 minutes per class

Content Statement

1. ***Changes in an organism's environment are sometimes beneficial to its survival and sometimes harmful.***

   Ecosystems can change gradually or dramatically. When the environment changes, some plants and animals survive and reproduce and others die or move to new locations. An animal's patterns of behavior are related to the environment. This includes the kinds and numbers of other organisms present, the availability of food and resources, and the physical attributes of the environment.

   Learning Targets:
   - I can analyze how gradual environmental changes in Ohio's ecosystem effect plants' and animals' survival.
   - I can analyze how dramatic environmental changes in Ohio's ecosystem effect plants' and animals' survival.

Content Elaborations

Prior Concepts Related to Earth's Living History

PreK-2: Plants and animals have variations in their physical traits that enable them to survive in a particular environment. Living things that once lived on Earth no longer exist, as their needs were not met. Living things have basic needs which are met by obtaining materials from the physical environment.

Grades 3: Plants and animals have life cycles that are part of their adaptations for survival in their natural environments.

Grade 4 Concepts

Ecosystems are based on interrelationships among and between biotic and abiotic factors. Ohio has experienced various weather patterns. Some parts of Ohio hosted glaciers and other parts of Ohio were submerged with water. Ecosystems can change rapidly (e.g., fire) or very slowly (e.g., climate change).

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- I can analyze how gradual and dramatic environmental changes in Ohio's ecosystem effect animals' behavioral patterns.
- I can evaluate fossils to interpret the changes that have occurred to the environment since the organism was alive.
- I can evaluate fossils to interpret the changes that have occurred to the population since the organism was alive.

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Major changes over a short period of time can have a significant impact on the ecosystem and the populations of plants and animals living there. The changes that occur in the plant and animal populations can impact access to resources for the remaining organisms, which may result in migration or death. The fossil record provides evidence for changes in populations of species.

Researching and investigating specific areas in Ohio (e.g., Cedar Bog, Lake Erie, Hocking Hills, Caesar Creek, Kelly's Island) via field studies, virtual field trips, or other references must be used to explore the relationships between previous environments, changes that have occurred in the environments, and the species that lived there.

Note: Grade 4 ES focuses on changes to Earth's surface due to erosion, deposition of soil, rock sediment, flooding, volcanoes, and earthquakes that can be taught along with this content.

Future Application of Concepts

Grades 6-8: Organisms that survive pass on their traits to future generations. Climate, rock record, and geologic periods are explored in Earth and Space Science.

High School: The concepts of evolution are explored.

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Content Vocabulary

- abiotic
- behavioral
- biotic
- ecosystem
- environment
- fossil
- fossil record
- migration
- organism
- populations
- species
- survival

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Academic Vocabulary

- change
- characteristics
- classification
- compare
- constructive
- data
- design
- destructive
- detect
- dramatic
- effect
- evidence
- experiment
- explore
- external
- feature
- formation
- gradual
- identify
- interact
- investigate
- investigation
- process
- transfer
- utilize

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Formative Assessments • Common Formative Assessments (CFAs) • Science journals • Labs • Exit slips	**Summative Assessments** • Topic projects • Test reflecting standards • Quizzes reflecting standards • Science journals • Labs
Resources • Focus Books: http://www.focuscurriculum.com/ • Gizmo (see 5th grade teachers): http://www.explorelearning.com/ • Science A-Z: http://www.sciencea-z.com	**Enrichment Strategies** • Gizmos (explorelearning.com) Activity C is often an extension for those that need a challenge • Focus Curriculum Leveled Reader Booklets...Above Level texts
Integrations • **ELA**: recording information in journals, reading in content area • **Math**: • **Social Studies**:	**Intervention Strategies** • Front loading vocabulary/vocabulary cards • Reading A-Z: leveled text that students can read or listen to • Focus Curriculum • Foldables

Grade Four Life Science

Theme ***Interconnections Within Systems***

This theme focuses on helping students recognize the components of various systems and then investigate dynamic and sustainable relationships within systems using scientific inquiry.

Strand Connection

Heat and electrical energy are forms of energy that can be transferred from one location to another. Matter has properties that allow the transfer of heat and electrical energy. Heating and cooling affect the weathering of Earth's surface and Earth's past environments. The processes that shape Earth's surface and the fossil evidence found can help decode Earth's history.

Science Inquiry and Applications:

During the years of PreK-4, all students must become proficient in the use of the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

- Observe and ask questions about the natural environment
- Plan and conduct simple investigations
- Employ simple equipment and tools to gather data and extend the senses
- Use appropriate mathematics with data to construct reasonable explanations
- Communicate about observations, investigations, and explanations
- Review and ask questions about the observations and explanations of others

Topic ***Earth's Living History***

This topic focuses on using fossil evidence and living organisms to observe that suitable habitats depend upon a combination of biotic and abiotic factors.

Pacing

5-7 classes at 45 minutes per class

Content Statement

2. Fossils can be compared to one another and to present-day organisms according to their similarities and differences.

The concept of biodiversity is expanded to include different classification schemes based upon shared internal and external characteristics of organisms.

Most types of organisms that have lived on Earth no longer exist. Fossils provide a point of comparison between the types of organisms that lived long ago and those existing today.

Learning Targets:

- I can compare fossils to one another by describing the similarities and differences based on observed structures.
- I can compare fossils to present day organisms by describing the similarities and differences based on observed structures.

Content Elaborations

Prior Concepts Related to Earth's Living History

PreK-2: Plants and animals have variations in their physical traits that enable them to survive in a particular environment. Living things that once lived on Earth no longer exist, as their needs were not met. Living things have basic needs which are met by obtaining materials from the physical environment.

Grades 3: Plants and animals have life cycles that are part of their adaptations for survival in their natural environments.

Grade 4 Concepts

Fossils provide evidence that many plant and animal species are extinct and that many species have changed over time. The types of fossils that are present provide evidence about the nature of the environment at that time. As the environment changed so did the types of organisms that could survive

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- I can use a scientific tool (i.e., hand lens, etc.) to identify similarities and differences of external structures of fossils.
- I can organize information gathered about fossils to create a classification system (i.e., anatomy—backbone, plants, exoskeleton; behavioral patterns—living in groups, lived near water/land; habitat—what kind of rock, climate, location).

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in that environment.

The opportunity to learn about an increasing variety of living organisms, both the familiar and the exotic, should be provided. The observations and descriptions of organisms should become more precise in identifying similarities and differences based upon observed structures. Emphasis can still be on external features; however, finer detail than before should be included. Hand lenses and microscopes should be routinely used. Microscopes are used not to study cell structure but to begin exploring the world of organisms that cannot be seen by the unaided eye. Non-Linnaean classification systems should be developed that focus on gross anatomy, behavior patterns, habitats, and other features.

Future Application of Concepts

Grades 6-8: Diversity of species will be explored in greater detail. The study of Modern Cell Theory and rock formation is required (Earth and Space Science).

High School: The concepts of evolution and cell biology are explored.

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Content Vocabulary

- behavior
- exotic
- external features
- extinct
- fossil
- habits
- organism
- scientific tool
- species
- structures (animal and plant)

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Academic Vocabulary

- change
- characteristics
- classification
- compare
- constructive
- data
- design
- destructive
- detect
- dramatic
- effect
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Formative Assessments

- Common Formative Assessments (CFAs)
- Science journals
- Labs

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Summative Assessments

- Topic projects
- Test reflecting standards
- Quizzes reflecting standards

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• Exit slips	• Science journals • Labs
Resources • Fossils or fossil kit • Internet • Research books • Focus Books: http://www.focuscurriculum.com/ • Gizmo (see 5th grade teachers): http://www.explorelearning.com/ • Science A-Z: http://www.sciencea-z.com	**Enrichment Strategies** • Orton Hall (geology museum at OSU) • Gizmos (explorelearning.com) Activity C is often an extension for those that need a challenge • Focus Curriculum Leveled Reader Booklets...Above Level texts
Integrations • **ELA**: recording information in journals, reading in content area • **Math**: • **Social Studies**:	**Intervention Strategies** • Front loading vocabulary/vocabulary cards • Reading A-Z: leveled text that students can read or listen to • Focus Curriculum • Foldables

Grade Four Physical Science

Theme ***Interconnections Within Systems***

This theme focuses on helping students recognize the components of various systems and then investigate dynamic and sustainable relationships within systems using scientific inquiry.

Strand Connection

Heat and electrical energy are forms of energy that can be transferred from one location to another. Matter has properties that allow the transfer of heat and electrical energy. Heating and cooling affect the weathering of Earth's surface and Earth's past environments. The processes that shape Earth's surface and the fossil evidence found can help decode Earth's history.

Science Inquiry and Applications:

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- Review and ask questions about the observations and explanations of others

Topic ***Electricity, Heat, and Matter***

This topic focuses on the conservation of matter and the processes of energy transfer and transformation, especially as they apply to heat and electrical energy.

Pacing

5-7 classes at 45 minutes per class

Content Statement

1. The total amount of matter is conserved when it undergoes a change.

When an object is broken into smaller pieces, when a solid is dissolved in a liquid, or when matter changes state (solid, liquid, gas), the total amount of matter remains constant.

Note 1: At this grade, the discussion of conservation of matter should be limited to a macroscopic, observable level.

Note 2: States of matter are found in PS grade 3. Heating and cooling is one way to change the state of matter.

Learning Targets:

- I can state that matter cannot be created or destroyed.
- I can use scientific equipment to measure the weight of an object.

Content Elaborations

Prior Concepts Related to Electricity, Heat, and Matter

PreK-2: Simple measuring instruments are used to observe and compare properties of objects. Changes in objects are investigated.

Grades 3: Objects are composed of matter, which has weight (mass*) and takes up space. Matter includes solids, liquids, and gases (air). Phase changes are explored.

Grade 4 Concepts

Some properties of objects may stay the same even when other properties change. For example, water can change from a liquid to a solid, but the mass of the water remains the same. Parts of an object or material may be assembled in different configurations, but the mass remains the same. The sum of all of the parts in an object equals the mass of the object.

• I can predict the weight of an object based upon the weight of its parts. • I can explain how matter cannot be destroyed (e.g., shredding paper, melting ice, dissolving sugar in water). • I can explain how matter cannot be created (e.g., water condensing on a cold surface, freezing water).	When a solid is dissolved in a liquid, the mass of the mixture is equal to the sum of the masses of the liquid and solid. At this grade level, the discussion of conservation of matter should be limited to a macroscopic, observable level. Conservation of matter must be developed from experimental evidence collected in the classroom. After the concept has been well established with experimental data and evidence, investigations can include interactions that are more complex where the mass may not appear to stay constant (e.g., fizzing tablets in water). Note: Mass* is an additive property of objects and volume is usually an additive property for the same material at the same conditions. However, volume is not always an additive property, especially if different substances are involved. For example, mixing alcohol with water results in a volume that is significantly less than the sum of the volumes. ***Future Application of Concepts*** Grades 6-8: Conservation of matter in phase changes and chemical reactions is explained by the number and type of atoms remaining constant. The idea of conservation of energy is introduced. *While mass is the scientifically correct term to use in this context, the NAEP 2009 Science Framework (page 27) recommends using the more familiar term "weight" in the elementary grades with the distinction between mass and weight being introduced at the middle school level. In Ohio, students will not be assessed on the differences between mass and weight until Grade 6.
Content Vocabulary • balance • conservation of matter • gas • liquid • mass • matter • properties • scale • solid • weight	**Academic Vocabulary** • change • characteristics • classification • compare • constructive • data • design • destructive • detect • explore • external • feature • formation • gradual • identify • interact • investigate • investigation

	• dramatic • effect • evidence • experiment • process • transfer • utilize
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Grade Four Physical Science

Theme ***Interconnections Within Systems***

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Strand Connection

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Science Inquiry and Applications:

During the years of PreK-4, all students must become proficient in the use of the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

- Observe and ask questions about the natural environment
- Plan and conduct simple investigations
- Employ simple equipment and tools to gather data and extend the senses
- Use appropriate mathematics with data to construct reasonable explanations
- Communicate about observations, investigations, and explanations
- Review and ask questions about the observations and explanations of others

Topic ***Electricity, Heat, and Matter***

This topic focuses on the conservation of matter and the processes of energy transfer and transformation, especially as they apply to heat and electrical energy.

Pacing

10-15 classes at 45 minutes per class

Content Statement

2. Energy can be transformed from one form to another or can be transferred from one location to another.

Energy transfers from hot objects to cold objects as heat, resulting in a temperature change.

Electric circuits require a complete loop of conducting materials through which an electrical energy can be transferred.

Electrical energy in circuits can be transformed to other forms of energy, including light, heat, sound, and motion.

Electricity and magnetism are closely related.

Learning Targets:

- I can predict how heat energy transfers from objects of different

Content Elaborations

Prior Concepts Related to Electricity, Heat, and Matter

PreK-2: Temperature is a property of objects. Sunlight affects the warming or cooling of air, water, and land (ESS). Charged objects can attract uncharged objects and may either attract or repel other charged objects. Magnetic objects can attract things made of iron and may either attract or repel other magnetic objects.

Grades 3: Objects that have energy can cause change. Heat, electrical energy, light, sound, and magnetic energy are all forms of energy.

Grade 4 Concepts

The addition of heat may increase the temperature of an object. The removal of heat may decrease the temperature of an object. There are materials in which the entire object becomes hot when one part of the object is heated

temperatures, resulting in a temperature change. • I can design a test to identify if an object is a conductor or an insulator of electricity. • I can construct a circuit to light a light bulb. • I can create electrical circuits which transform energy into light, sound, heat, or motion energy. • I can magnetize a nail with an electric circuit. • I can detect a magnetic field around a circuit.	(e.g., in a metal pan, heat flows through the pan on the stove transferring the heat from the burner outside the pan to the food in the pan). There are other objects in which parts of the object remain cool even when another part of the object is heated (e.g., in a Styrofoam® cup, very little of the warmth from hot liquid inside the cup is transferred to the hand holding the cup). Electrical conductors are materials through which electricity can flow easily. Electricity introduced to one part of the object spreads to other parts of the object (e.g., copper wire is an electrical conductor because electricity flows through the wires in a lamp from the outlet to the light bulb and back to the outlet). Electrical insulators are materials through which electricity cannot flow easily. Electricity introduced to one part of the object does not spread to other parts of the object (e.g., rubber surrounding a copper wire is an electrical insulator because electricity does not flow through the rubber to the hand holding it). Electrical conductivity must be explored through testing common materials to determine their conductive properties. In order for electricity to flow through a circuit, there must be a complete loop through which the electricity can pass. When an electrical device (e.g., lamp, buzzer, motor) is not part of a complete loop, the device will not work. Electric circuits must be introduced in the laboratory by testing different combinations of electrical components. When an electrical device is a part of a complete loop, the electrical energy can be changed into light, sound, heat, or magnetic energy. Electrical devices in a working circuit often get warmer. When a magnet moves in relation to a coil of wire, electricity can flow through the coil. When a wire conducts electricity, the wire has magnetic properties and can push and/or pull magnets. The connections between electricity and magnetism must be explored in the laboratory through experimentation. **Note 1**: Exploring heat transfer in terms of moving submicroscopic particles is not appropriate at this grade level. **Note 2**: The word “heat” is used loosely in everyday language, yet it has a very specific scientific meaning. Usually what is called hat is actually “thermal or

	radiant energy." An object has thermal energy due to the random movement of the particles that make up the object. Radiant energy is that which is given off by objects through space (e.g., warmth from a fire, solar energy from the sun). "Heating" is used to describe the transfer of thermal or radiant energy to another object or place. Differentiating between these concepts is inappropriate at this grade level. This document uses the same conventions as noted in the NAEP 2009 Science Framework (see page 29) where "heat" is used in lower grades. However, the word "heat" has been used with care so it refers to a transfer of thermal or radiant energy. The concept of thermal energy, as it relates to particle motion, is introduced in grade 6. **Note 3**: Knowing the specifics of electromagnetism is not appropriate at this grade level. At this point, the connections between electricity and magnetism are kept strictly experiential and observational. **Note 4**: Energy transfer (between objects or places) should not be confused with energy transformation from one form of energy to another (e.g., electrical energy to light energy). ***Future Application of Concepts*** Grade 5: Light and sound are explored further as forms of energy. Grades 6-8: Thermal energy is related to the atomic theory. Kinetic and potential energy are two ways objects can store energy. Conservation of energy and energy transfer through radiation, convection, and conduction and the transfer of electrical energy in circuits are introduced.
Content Vocabulary • battery • circuit • coil • conductor • electricity • electromagnet • energy • energy flow • energy transfer • heat energy • insulator • magnetic • magnetic field • magnetism • temperature • thermal energy • transfer • transform	**Academic Vocabulary** • change • characteristics • classification • compare • constructive • data • design • destructive • detect • dramatic • effect • explore • external • feature • formation • gradual • identify • interact • investigate • investigation • process • transfer

	• evidence • experiment • utilize
Formative Assessments • Common Formative Assessments (CFAs) • Science journals • Labs • Exit slips	**Summative Assessments** • Topic projects • Test reflecting standards • Quizzes reflecting standards • Science journals • Labs
Resources • Focus Books: http://www.focuscurriculum.com/ • Gizmo (see 5th grade teachers): http://www.explorelearning.com/ • Science A-Z: http://www.sciencea-z.com	**Enrichment Strategies** • Gizmos (explorelearning.com) Activity C is often an extension for those that need a challenge • Focus Curriculum Leveled Reader Booklets...Above Level texts
Integrations • **ELA**: recording information in journals, reading in content area • **Math**: • **Social Studies**:	**Intervention Strategies** • Front loading vocabulary/vocabulary cards • Reading A-Z: leveled text that students can read or listen to • Focus Curriculum • Foldables