Grade Five 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

Cycles on Earth, such as those occurring in ecosystems, in the solar system, and in the movement of light and sound result in describable patterns. Speed is a measurement of movement. Change in speed is related to force and mass*. The transfer of energy drives changes in systems, including ecosystems and physical systems.

*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.

Science Inquiry and Applications:

During the years of grades 5-8, all students must use the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

- Identify questions that can be answered through scientific investigations
- Design and conduct a scientific investigation
- Use appropriate mathematics, tools, and techniques to gather data and information
- Analyze and interpret data; develop descriptions, models, explanations, and predictions
- Think critically and logically to connect evidence and explanations
- Recognize and analyze alternative explanations and predications
- Communicate scientific procedures and explanations

Topic ***Cycles and Patterns in the Solar System***	**Pacing**
This topic focuses on the characteristics, cycles, and patterns in the solar system and within the universe.	2-3 weeks

Content Statement	**Content Elaborations**
1. The solar system includes the sun and all celestial bodies that orbit the sun. Each planet in the solar system has unique characteristics. The distance from the sun, size, composition, and movement of each planet are unique. Planets revolve around the sun in elliptical orbits. Some of the planets have moons and/or debris that orbit them. Comets, asteroids, and meteoroids orbit the sun. **Note**: The shape of Earth's orbit is nearly circular (also true for other	***Prior Concepts Related to Solar System*** PreK-2: The moon, sun, and stars can be observed at different times of the day or night. The observable shape of the moon changes throughout the month, the sun's position in the sky changes in a single day and from day to day, and the sun is the principal source of energy. Earth's atmosphere is discussed. Grades 3-4: All objects are made of matter, and light is a form of energy. Earth's surface is discussed, and gravitational forces are introduced.

planets). Many graphics that illustrate the orbit overemphasize the elliptical shape, leading to the misconception regarding seasonal change being related to how close Earth is to the sun. The discussion of planet characteristics should be at an introductory level for this grade. The tilt of the Earth determines the seasons. When the Northern Hemisphere is tilted toward the sun, we are experiencing summer.

Learning Targets:

- I can compare and contrast the eight major planets in the solar system that orbit the sun and identify their characteristics such as position, composition, and known moons.
- I can differentiate between planets and dwarf planets.
- I can compare and contrast the difference between asteroids, comets, meteors, and meteoroids.
- I can explain and illustrate the position of the sun, moons, earth, and planets and how they are related to gravitational forces.
- I can research and summarize current events in earth/space science that demonstrate changes in our universe.

Grade 5 Concepts

Eight major planets in the solar system orbit the sun. Some of the planets have a moon or moons that orbit them. Earth is a planet that has a moon that orbits it. The planets' orbits are because of their gravitational attraction to the sun. Moons orbit around planets because of their gravitational attraction to the planets.

Asteroids are metallic, rocky bodies that orbit the sun but are too small to be classified as a planet. A meteor appears when a particle or chunk of metallic or stony matter called a meteoroid enters Earth's atmosphere from outer space. Comets are a mixture of ices (both water and frozen gases) that are not part of a planet. Pluto is classified as a dwarf planet (definition from http://www.nasa.gov).

General information regarding planetary positions, orbital patterns, planetary composition, and recent discoveries and projects (e.g., missions to Mars) are included in this content. Tools and technology are an essential part of understanding the workings within the solar system.

Note: Additional information about gravity is found in PS grade 5.

Future Application of Concepts

Grades 6-8: The interior and exterior composition of Earth; Earth's unique atmosphere; light waves; electromagnetic waves; interactions between Earth, moon, and sun; and gravitational forces are explored in more depth.

High School: Galaxies, stars, and the universe are studied in the physical sciences.

Content Vocabulary

- asteroid
- axis
- comet
- composition
- dwarf planet
- elliptical
- gravity
- meteor

Academic Vocabulary

- analyze
- appear
- appearance
- apply
- articulate
- assemble
- characteristics
- chart
- example
- exchange
- graph
- graphic
- hypothesize
- identify
- illustrate
- influence

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interaction
interdependencies
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relate
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seasonal
simulation
stability
survival
transfer
transform
transformation
vast

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Formative Assessments

Common Formative Assessments via Portal, Science Journals, Labs

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Summative Assessments

Planet Project (paper, model, and presentation), tests and quizzes reflecting standards, Science Journals, Labs

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Resources

Gizmos (explorelearning.com): Solar System
Focus Curriculum Leveled Reader Booklets: Our Solar System
Reading A-Z: Meteors and Meteorites (level U); Sun, Earth, and Moon (level W)

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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: Research reports of bodies in space
Reading A-Z: Meteors and Meteorites (level U), Main Idea, Summarizing, Alphabetical Order, Suffixes
Focus Curriculum
Math: Scientific notation, exponential notation, exponents
Social Studies: Research current events in space exploration

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Intervention Strategies

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 Five 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

Cycles on Earth, such as those occurring in ecosystems, in the solar system, and in the movement of light and sound result in describable patterns. Speed is a measurement of movement. Change in speed is related to force and mass*. The transfer of energy drives changes in systems, including ecosystems and physical systems.

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Science Inquiry and Applications:

During the years of grades 5-8, all students must use the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

- Identify questions that can be answered through scientific investigations
- Design and conduct a scientific investigation
- Use appropriate mathematics, tools, and techniques to gather data and information
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- Think critically and logically to connect evidence and explanations
- Recognize and analyze alternative explanations and predications
- Communicate scientific procedures and explanations

Topic ***Cycles and Patterns in the Solar System***

This topic focuses on the characteristics, cycles, and patterns in the solar system and within the universe.

Pacing

2-3 weeks

Content Statement

2. The sun is one of many stars that exist in the universe.

The sun appears to be the largest star in the sky because it is the closest star to Earth. Some stars are larger than the sun and some stars are smaller than the sun.

Learning Targets:

- I can determine why stars, like the sun, appear to be different sizes and compare them with their actual characteristics (brightness, size,

Content Elaborations

Prior Concepts Related to Sun

PreK-2: The sun can be observed at different times of the day or night. The sun's position in the sky changes in a single day and from day to day. The sun is the principal source of energy.

Grades 3-4: All objects are made of matter. Heat and light are forms of energy. Gravitational forces are introduced.

Grade 5 Concepts

distance). • I can compare characteristics of the sun with characteristics of the earth.	The sun is the closest star to the Earth. Scaled models (3-D or virtual) and graphics can be used to show the vast difference in size between the sun and the Earth. The sun is a medium-sized star and is the only star in our solar system. There are many other stars of different sizes in the universe. Because they are so far away, they do not appear as large as the sun. General facts about the size and composition of the sun are introduced. Details (e.g., age of the sun, specific composition, temperature values) are above grade level. The emphasis should be on general characteristics of stars and beginning to understand the size and distance of the sun in relationship to the Earth and other planets. Current and new discoveries related to stars and the sun must be included. ***Future Application of Concepts*** Grades 6-8: Earth's unique atmosphere, light waves, electromagnetic waves, interactions between the Earth, moon, and sun (including the phases of the moon and tides), and gravitational forces are explored in more depth. High School: Galaxies, stars, and the universe are studied in the physical sciences.
Content Vocabulary • corona • helium • hydrogen • magnitude • radiation • solid • sphere • sun flares • sun spot	**Academic Vocabulary** • analyze • appear • appearance • apply • articulate • assemble • characteristics • chart • clarify • classify • compare • complete • components • conclude • continual • contrast • correlate • example • exchange • graph • graphic • hypothesize • identify • illustrate • influence • interaction • interdependencies • interdependent • interrelationships • interwoven • observe • position • regional • relate

	• demonstrate • depict • detect • determine • differentiate • dynamic relationships • emit • essential • evaluate • examine • relationship • seasonal • simulation • stability • survival • transfer • transform • transformation • vast
Formative Assessments • Common Formative Assessments via Portal, Science Journals, Labs	**Summative Assessments** • Tests and Quizzes, Science Journals, Labs
Resources • Gizmos (explorelearning.com) • Focus Curriculum Leveled Reader Booklets • Reading A-Z: The Sun (level V) • Beyond Weather and the Water Cycle http://beyondweather.ehe.osu.edu	**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**: Points of View • Reading A-Z: The Sun, Cause and Effect, Adjectives, Main Idea and Details • Focus Curriculum • **Math**: Reading A-Z: The Sun, Numbers and Symbols • **Social Studies**: Navigation and agriculture (many people used the stars to sail during exploration and for knowing seasons and when to farm) • **Science**: Connects to thermal energy, Sexton, light and energy for ecosystems	**Intervention Strategies** • Front loading vocabulary/vocabulary cards • Reading A-Z: leveled text that students can read or listen to • Focus Curriculum • Foldables

Grade Five 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

Cycles on Earth, such as those occurring in ecosystems, in the solar system, and in the movement of light and sound result in describable patterns. Speed is a measurement of movement. Change in speed is related to force and mass*. The transfer of energy drives changes in systems, including ecosystems and physical systems.

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Science Inquiry and Applications:

During the years of grades 5-8, all students must use the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

- Identify questions that can be answered through scientific investigations
- Design and conduct a scientific investigation
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- Communicate scientific procedures and explanations

Topic ***Cycles and Patterns in the Solar System***

This topic focuses on the characteristics, cycles, and patterns in the solar system and within the universe.

Pacing

2-3 weeks

Content Statement

3. Most of the cycles and patterns of motion between the Earth and sun are predictable.

Earth's revolution around the sun takes approximately 365 days. Earth completes one rotation on its axis in a 24-hour period, producing day and night. This rotation makes the sun, stars, and moon appear to change position in the sky. Earth's axis is tilted at an angle of 23.5°. This tilt, along with Earth's revolution around the sun, affects the amount of direct sunlight that the Earth receives in a single day and throughout the year.

Content Elaborations

Prior Concepts Related to Earth, Sun, and Moon

PreK-2: The sun and moon can be observed at different times of the day or night. The sun's position in the sky changes in a single day and from day to day. The observable shape of the moon changes throughout the month. The sun is the principal source of energy.

Grades 3-4: All objects are made of matter. Heat and light are forms of energy. Gravitational forces are introduced.

The average daily temperature is related to the amount of direct sunlight received. Changes in average temperature throughout the year are identified as seasons.

Note 1: The amount of direct sunlight that Earth receives is related to the altitude of the sun, which affects the angle of the sun's rays, and the amount of time the sun is above the horizon each day.

Note 2: Different regions around the world have seasonal changes that are not based solely on average temperature (e.g., rainy season, dry season, monsoon season).

Learning Targets:

- I can determine what causes seasonal changes and regional weather patterns on the Earth.
- I can explain major patterns and cycles of the Earth (day/night, seasons, year, tides, moon phases).

Grade 5 Concepts

Models, interactive websites, and investigations are required to illustrate the predictable patterns and cycles that lead to the understanding of day and night, seasons, years, and the amount of direct sunlight Earth receives. Three-dimensional models should be used to demonstrate that the tilt of Earth's axis is related to the amount of direct sunlight received and seasonal temperature changes.

Seasonal change should be expanded in grade 5 to include regions of the world that experience specific seasonal weather patterns (e.g., hurricane season, monsoon season, rainy season, dry season). This builds upon making observations of the seasons throughout the school year in the earlier grades.

Future Application of Concepts

Grades 6-8: Earth's unique atmosphere, light waves, electromagnetic waves, interactions between the Earth, moon, and sun (including the phases of the moon and tides), climate studies, and gravitational forces are explored in more depth.

High School: Galaxies, stars, and the universe are studied in the physical sciences.

Content Vocabulary

- climate
- hurricane
- monsoon
- regions

Academic Vocabulary

- analyze
- appear
- appearance
- apply
- articulate
- assemble
- characteristics
- chart
- clarify
- classify
- compare
- complete
- components
- conclude
- continual
- contrast
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- regional

	• correlate • demonstrate • depict • detect • determine • differentiate • dynamic relationships • emit • essential • evaluate • examine • relate • relationship • seasonal • simulation • stability • survival • transfer • transform • transformation • vast
Formative Assessments • Common Formative Assessments via Portal, Science Journals, Labs	**Summative Assessments** • Tests, Quizzes, Labs, Science Journals, Biome Project (paper, presentation, PowerPoint, poster, video)
Resources • Gizmos (explorelearning.com) Seasons: Earth, Moon and Sun; Summer and Winter; Solar System; Ocean Tides, Moon Phases • Focus Curriculum Leveled Reader Booklets • Reading A-Z • Beyond Weather and the Water Cycle http://beyondweather.ehe.osu.edu	**Enrichment Strategies** • Gizmos (explorelearning.com) Activity C is often an extension for those that need a challenge. Also the Eclipse gizmo can be an extension; there are also ELA integrations for this. • Focus Curriculum Leveled Reader Booklets...Above Level texts
Integrations • **ELA**: Reading A-Z, Focus Curriculum • **Math**: Refer to angles, scientific notation, scaling a solar system to comparable sizes, measurement • **Social Studies**: Regions • **Life Science**: Biomes	**Intervention Strategies** • Front loading vocabulary/vocabulary cards • Reading A-Z: leveled text that students can read or listen to • Focus Curriculum • Foldables • Hands-on activities such as using foam ball, flashlight

Grade Five 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

Cycles on Earth, such as those occurring in ecosystems, in the solar system, and in the movement of light and sound result in describable patterns. Speed is a measurement of movement. Change in speed is related to force and mass*. The transfer of energy drives changes in systems, including ecosystems and physical systems.

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Science Inquiry and Applications:

During the years of grades 5-8, all students must use the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

- Identify questions that can be answered through scientific investigations
- Design and conduct a scientific investigation
- Use appropriate mathematics, tools, and techniques to gather data and information
- Analyze and interpret data; develop descriptions, models, explanations, and predictions
- Think critically and logically to connect evidence and explanations
- Recognize and analyze alternative explanations and predications
- Communicate scientific procedures and explanations

Topic ***Interconnections Within Ecosystems***

This topic focuses on foundational knowledge of the structures and functions of ecosystems.

Pacing

3-4 weeks

Content Statement

1. Organisms perform a variety of roles in an ecosystem.

Populations of organisms can be categorized by how they acquire energy.

Food webs can be used to identify the relationships among producers, consumers, and decomposers in an ecosystem.

Learning Targets:

- I can describe how changes in an organism's habitat are sometimes beneficial and sometimes harmful.

Content Elaborations

Prior Concepts Related to Behavior, Growth, and Changes

PreK-2: Plants get energy from sunlight. Animals get energy from plants and other animals. Living things cause changes on Earth.

Grade 5 Concepts

The content statements for fifth-grade life science are each partial components of a larger concept. The parts have been isolated to call attention to the depth of knowledge required to build to one of biology's foundational theories:

• I can describe how organisms interact with one another in various ways. • I can describe the role of producers in the transfer of energy entering ecosystems as sunlight to chemical energy through photosynthesis. • I can trace the flow of energy in an ecosystem by creating food chains and food webs. • I can compare changes in an organism's ecosystem/habitat that affect its survival. • I can summarize that organisms can survive only in ecosystems in which their needs can be met.	dynamic relationships within ecosystems. It is recommended that the content statements be combined and taught as a whole. For example, it is important that the ecological role of organisms is interwoven with a clear understanding that all living things require energy. Plants and some microorganisms are producers. They are the foundation of the food web. Producers transform energy from the sun and make food through a process called photosynthesis. Animals get their energy by eating plants and other animals that eat plants. Animals are consumers and many form predator-prey relationships. Decomposers (primarily bacteria and fungi) are consumers that use waste materials and dead organisms for food. Decomposers also return nutrients to the ecosystem. One way ecosystem populations interact is centered on relationships for obtaining energy. Food webs are defined in many ways, including as a scheme of feeding relationships, which resemble a web. This web serves as a model for feeding relationships of member species within a biological community. Members of a species may occupy different positions during their lives. Food chains and webs are schematic representations of real-world interactions. For this grade level, it is enough to recognize that food webs represent an intertwining of food chains within the same biological community. See the content statement for details on grade-appropriate food webs. Organisms have symbiotic relationships in which individuals of one species are dependent upon individuals of another species for survival. Symbiotic relationships can be categorized as mutualism where both species benefit, commensalism where one species benefits and the other is unaffected, and parasitism where one species benefits and the other is harmed. Investigations of locally threatened or endangered species must be conducted and include considerations of the effects of remediation programs, species loss, and the introduction of new species on the local environment. Note: At this grade, species can be defined by using Ernst Mayer's definition "groups of actually or potentially interbreeding natural populations, which are reproductively isolated from other such groups." Assessments will not include the definition of species.

	Future Application of Concepts Grades 6-8: The importance of biodiversity within an ecosystem is explored. High School: The concepts of evolution and biodiversity are explored.
Content Vocabulary • biodiversity • chain • commensalism • community • consumers • decomposers • ecosystem • endangered • extinct • food web • habitat • mutualism • nutrients • parasitism • photosynthesis • population • producers • species • symbiosis • threatened	**Academic Vocabulary** • analyze • appear • appearance • apply • articulate • assemble • characteristics • chart • clarify • classify • compare • complete • components • conclude • continual • contrast • correlate • demonstrate • depict • detect • determine • differentiate • dynamic relationships • emit • essential • evaluate • examine • example • exchange • graph • graphic • hypothesize • identify • illustrate • influence • interaction • interdependencies • interdependent • interrelationships • interwoven • observe • position • regional • relate • relationship • seasonal • simulation • stability • survival • transfer • transform • transformation • vast
Formative Assessments • Common Formative Assessments, Science Journals, Labs	**Summative Assessments** • Quizzes, Tests, Labs (for Inquiry grade), and Science Journals
Resources • Gizmos (explorelearning.com) Forest, Prairie, and Pond Ecosystem	**Enrichment Strategies** • Gizmos (explorelearning.com) Activity C is often an extension for those

• Focus Curriculum Leveled Reader Booklets: Energy in Ecosystems, Interdependence in Ecosystems, What Happens When Habitats Change? • Reading A-Z (Symbiotic Wildlife, level Z; Amazing Undersea Food Web, level X; Saving the Salmon, level X) • ***The Lorax***, by Dr. Seuss	that need a challenge. • Focus Curriculum Leveled Reader Booklets...Above Level texts
Integrations • **ELA**: Reading A-Z, Focus Curriculum Symbiotic Wildlife, level Z (Before and After, Venn Diagram, Commas); Amazing Undersea Food Web, level X (charts and graphs, sentence structure, synonym and antonyms); Saving the Salmon, level X (summarize, cause and effect, alphabetical order) • Biome research projects • **Math**: Tally producers, consumers, decomposers during outdoor lesson. Graph the totals and compare to understand why there needs to be more producers. • **Social Studies**: Economics, relates to geography/climates and weather	**Intervention Strategies** • Front loading vocabulary/vocabulary cards • Reading A-Z: leveled text that students can read or listen to, discussion cards • Focus Curriculum • Foldables

Grade Five 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

Cycles on Earth, such as those occurring in ecosystems, in the solar system, and in the movement of light and sound result in describable patterns. Speed is a measurement of movement. Change in speed is related to force and mass*. The transfer of energy drives changes in systems, including ecosystems and physical systems.

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Science Inquiry and Applications:

During the years of grades 5-8, all students must use the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

- Identify questions that can be answered through scientific investigations
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- Analyze and interpret data; develop descriptions, models, explanations, and predictions
- Think critically and logically to connect evidence and explanations
- Recognize and analyze alternative explanations and predications
- Communicate scientific procedures and explanations

Topic ***Interconnections Within Ecosystems***	**Pacing**
This topic focuses on foundational knowledge of the structures and functions of ecosystems.	3-4 weeks

Content Statement	**Content Elaborations**
2. All of the processes that take place within organisms require energy. For ecosystems, the major source of energy is sunlight. Energy entering ecosystems as sunlight is transferred and transformed by producers into energy that organisms use through the process of photosynthesis. That energy then passes from organism to organism as illustrated in food webs. In most ecosystems, energy derived from the sun is transferred and	***Prior Concepts Related to Behavior, Growth, and Changes*** PreK-2: Living things have basic needs, which are met by obtaining materials from physical environments. ***Grade 5 Concepts*** The content statements for fifth-grade life science are each partial components of a larger concept. The parts have been isolated to call attention to the depth of knowledge required to build to one of biology's foundational theories:

transformed into energy that organisms use by the process of photosynthesis in plants and other photosynthetic organisms.

Learning Targets:

- I can explain how food can be traced back to plants and the energy from the sun.
- I can describe the role of producers in the transfer of energy entering ecosystems as sunlight to chemical energy through photosynthesis.

dynamic relationships within ecosystems. It is recommended that the content statements be combined and taught as a whole. For example, it is important that the ecological role of organisms is interwoven with a clear understanding that all living things require energy. Virtual simulations and investigations can help demonstrate energy flow through the trophic levels.

Energy flows through an ecosystem in one direction, from photosynthetic organisms to consumers (herbivores, omnivores to carnivores) and decomposers. The exchange of energy that occurs in an ecosystem can be represented as a food web. The exchange of energy in an ecosystem is essential because all processes of life for all organisms require a continual supply of energy.

Satellite imaging, remote sensing, or other digital-research formats can be used to help visualize what happens in an ecosystem when new producers (e.g., Tamarisk plants) are introduced into an ecosystem. The information gained should be used to determine the relationship between the producers and consumers within an ecosystem.

Future Application of Concepts

Grades 6-8: Concepts will build for an understanding of the interdependencies and interrelationships of organisms that are required to build stability in an ecosystem.

High School: Photosynthesis will be introduced.

Note: The chemical details of photosynthesis will be addressed in grade 10. This is just an introduction of the process, not the details of the process.

Content Vocabulary

- carnivore
- consumers
- food chain
- food web
- herbivore
- omnivore
- predator
- prey
- producers

Academic Vocabulary

- analyze
- appear
- appearance
- apply
- articulate
- assemble
- characteristics
- chart
- clarify
- example
- exchange
- graph
- graphic
- hypothesize
- identify
- illustrate
- influence
- interaction

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- trophic levels

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- components
- conclude
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- contrast
- correlate
- demonstrate
- depict
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- determine
- differentiate
- dynamic relationships
- emit
- essential
- evaluate
- examine
- interdependencies
- interdependent
- interrelationships
- interwoven
- observe
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- regional
- relate
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- stability
- survival
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- transformation
- vast

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Formative Assessments

- Common Formative Assessments via Portal, Science Journals, Labs

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Summative Assessments

- Tests, Quizzes, Science Journals, Labs, Pictures of Food Chains and Food Webs

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Resources

- Gizmos (explorelearning.com) Food Chain
- Focus Curriculum Leveled Reader Booklets
- Reading A-Z

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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**: Reading A-Z, Focus Curriculum
- **Math**: Percent of energy transferred from organism to organism
- **Social Studies**: When people came over to the Americas they brought diseases and bugs, other animals and plants that impacted others (Columbian Exchange).

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Intervention Strategies

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

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Grade Five 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

Cycles on Earth, such as those occurring in ecosystems, in the solar system, and in the movement of light and sound result in describable patterns. Speed is a measurement of movement. Change in speed is related to force and mass*. The transfer of energy drives changes in systems, including ecosystems and physical systems.

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Science Inquiry and Applications:

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- Analyze and interpret data; develop descriptions, models, explanations, and predictions
- Think critically and logically to connect evidence and explanations
- Recognize and analyze alternative explanations and predications
- Communicate scientific procedures and explanations

Topic ***Light, Sound, and Motion***

This topic focuses on the forces that affect motion. This includes the relationship between the change in speed of an object, the amount of force applied, and the mass* of an object. Light and sound are explored as forms of energy that move in predictable ways, depending on the matter through which they move.

Pacing

3-4 weeks

Content Statement

1. ***The amount of change in movement of an object is based on the mass of the object and the amount of force exerted.***

   Movement can be measured by speed. The speed of an object is calculated by determining the distance (d) traveled in a period of time (t).

Content Elaborations

Prior Concepts Related to Behavior, Growth, and Changes

PreK-2: Motion is described as a change in position. Forces are introduced as pushes and pulls. Forces are needed to change the motion of objects. Greater force on an object results in a greater change of motion.

Grades 3-4: Forces in nature are responsible for water movement, wind

Earth pulls down on all objects with a gravitational force. Weight is a measure of the gravitational force between an object and the Earth.

Any change in speed or direction of an object requires a force and is affected by the mass* of the object and the amount of force applied.

Note 1: Gravity and magnetism are introduced (through observation) in PS grade 2.

*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.

Learning Targets:

- I can describe how forces affect motion.
- I can describe how motion, force, and the mass of an object affect the speed of an object.
- I can justify why speed, distance, and time are related.

movement, and movement of sediment through the process of erosion (ESS).

Grade 5 Concepts

The motion of an object can change by speeding up, slowing down, or changing direction. Forces cause changes in motion. If a force is applied in the same direction of an object's motion, the speed will increase. If a force is applied in the opposite direction of an object's motion, the speed will decrease. Generally, the greater the force acting on an object, the greater the change in motion. Generally, the more mass* an object has, the less influence a given force will have on its motion. If no forces act on an object, the object does not change its motion and moves at constant speed in a given direction. If an object is not moving and no force acts on it, the object will remain at rest.

Movement is measured by speed (how fast or slow the movement is). Speed is measured by time and distance traveled (how long it took the object to go a specific distance). Speed is calculated by dividing distance by time. Speed must be investigated through testing and experimentation. Real-world settings are recommended for the investigations when possible. Virtual investigations and simulations also can be used to demonstrate speed.

An object that moves with constant speed travels the same distance in each successive unit of time. In the same amount of time, a faster object moves a greater distance than a slower object. When an object is speeding up, the distance it travels increases with each successive unit of time. When an object is slowing down, the distance it travels decreases with each successive unit of time.

Speed must be explored and tested through investigations (3-D or virtual) inside and outside of the classroom. Video technology can be used to stop movement and measure changes at different steps in the investigations.

Note 1: This content can be taught in conjunction with the following ESS content. Everything on or anywhere near Earth is pulled toward Earth's center by gravitational force. Weight is a measure of this force. The planets are kept in orbit due to their gravitational attraction for the sun.

Note 2: Concepts are related to Newton's second law remain conceptual at

	this grade. Knowing the name of the law is not required. Memorizing and reciting words to describe Newton's second law is not appropriate. Note 3: Although mathematics is applied to the concept of speed at this grade level, its use should support deeper understanding of the concept of speed and not be taught as the primary definition of speed. ***Future Application of Concepts*** Grades 6-8: Force and motion involve both magnitude and direction. Two equal forces in opposite directions can give a net force of zero. Position vs. time and speed vs. time graphs are used to represent motion. Fields are introduced for forces that act over a distance. High School: Newton's second law is used to solve mathematical problems in one and two dimensions. *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 • force • gravity • mass	**Academic Vocabulary** • analyze • appear • appearance • apply • articulate • assemble • characteristics • chart • clarify • classify • compare • complete • components • conclude • continual • contrast • example • exchange • graph • graphic • hypothesize • identify • illustrate • influence • interaction • interdependencies • interdependent • interrelationships • interwoven • observe • position • regional

	• correlate • demonstrate • depict • detect • determine • differentiate • dynamic relationships • emit • essential • evaluate • examine • relate • relationship • seasonal • simulation • stability • survival • transfer • transform • transformation • vast
Formative Assessments • Common Formative Assessments via Portal, Science Journals, Labs	**Summative Assessments** • Quizzes, Tests, Science Labs, Journals
Resources • Gizmos (explorelearning.com) • Focus Curriculum Leveled Reader Booklets: What is Energy?, Forces and Motion • Reading A-Z	**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**: Reading A-Z, Focus Curriculum • **Math**: Gizmo Distance-Time Graphs • **Social Studies**: Study inventors, people in society • Primary/Secondary Sources	**Intervention Strategies** • Front loading vocabulary/vocabulary cards • Reading A-Z: leveled text that students can read or listen to, discussion cards • Focus Curriculum • Foldables

Grade Five 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

Cycles on Earth, such as those occurring in ecosystems, in the solar system, and in the movement of light and sound result in describable patterns. Speed is a measurement of movement. Change in speed is related to force and mass*. The transfer of energy drives changes in systems, including ecosystems and physical systems.

*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.

Science Inquiry and Applications:

During the years of grades 5-8, all students must use the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

- Identify questions that can be answered through scientific investigations
- Design and conduct a scientific investigation
- Use appropriate mathematics, tools, and techniques to gather data and information
- Analyze and interpret data; develop descriptions, models, explanations, and predictions
- Think critically and logically to connect evidence and explanations
- Recognize and analyze alternative explanations and predications
- Communicate scientific procedures and explanations

Topic ***Light, Sound, and Motion***	**Pacing**
This topic focuses on the forces that affect motion. This includes the relationship between the change in speed of an object, the amount of force applied, and the mass* of an object. Light and sound are explored as forms of energy that move in predictable ways, depending on the matter through which they move.	3-4 weeks
Content Statement	**Content Elaborations**
2. Light and sound are forms of energy that behave in predictable ways. Light travels and maintains its direction until it interacts with an object and moves from one medium to another and then it can be reflected, refracted, or absorbed.	***Prior Concepts Related to Behavior, Growth, and Changes*** PreK-2: Sound is related to vibrations (PS). The moon, sun, and stars are visible at different times. The sun is the principal source of energy. Sunlight affects the warming and cooling of air, water, and land (ESS). Grades 3-4: Objects with energy can cause motion or create change. Energy

Sound is produced by vibrating objects and requires a medium through which to travel. The rate of vibration is related to the pitch of the sound.

Note: At this grade level, the discussion of light and sound should be based on observable behavior. Waves are introduced at the middle school level.

Learning Targets:

- I can prove how light is reflected, refracted, and absorbed through various mediums.
- I can describe how light can travel through some materials including empty space.
- I can demonstrate how light energy can transform into thermal energy.
- I can demonstrate how sound is produced by vibrating objects.
- I can determine how pitch is affected by the rate of vibration.
- I can illustrate how sound travels at different speeds through different media.
- I can compare and contrast the properties of light and sound.

can transfer between objects and locations. Light energy from the sun can cause plants to grow (LS).

Grade 5 Concepts

Light can travel through some materials, such as glass or water. Light also can travel through empty space, like from the sun to Earth. When light travels from one location to another, it goes in a straight line until it interacts with another object or material. When light strikes objects through which it cannot pass, shadows are formed. As light reaches a new material, it can be absorbed, refracted, reflected or can continue to travel through the new material; one of these interactions may occur or many may occur simultaneously, depending on the material.

Light can be absorbed by objects, causing them to warm. How much an object's temperature increases depends on the material of the object, the intensity of and the angle at which the light strikes its surface, how long the light shines on the object, and how much light is absorbed. Investigating and experimenting with temperature changes caused by light striking different surfaces can be virtual or in a lab setting.

When light passes from one material to another, it is often refracted at the boundary between the two materials and travels in a new direction through the new material (medium). For example, a magnifying lens bends light and focuses it toward a single point. A prism bends white light and separates the different colors of light. Experiment with prisms and magnifying lenses to observe the refraction of light.

Visible light may be emitted from an object (like the sun) or reflected by an object (like a mirror or the moon). The reflected colors are the only colors visible when looking at an object. For example, a red apple looks red because the red light that hits the apple is reflected while the other colors are absorbed.

Pitch can be changed by changing how fast an object vibrates. Objects that vibrate slowly produce low pitches; objects that vibrate quickly produce high pitches. Audible sound can only be detected within a certain range of pitches. Sound must travel through a material (medium) to move from one place to another. This medium may be a solid, liquid, or gas. Sound travels at different

	speeds through different media. Once sound is produced, it travels outward in all directions until it reaches a different medium. When it encounters this new medium, the sound can continue traveling through the new medium, become absorbed by the new medium, bounce back into the original medium (reflected), or engage in some combination of these possibilities. Light travels faster than sound. Technology and virtual simulations and models can help demonstrate movement of light and sound. Experimentation, testing, and investigation (3-D or virtual) are essential components of learning about light and sound properties. Note: Students are not responsible for knowing the additive rules for color mixing of light other than the fact that white light is a mixture of many colors. The wave nature of sound and light are not introduced at this level nor are parts of the electromagnetic spectrum other than visible light. At this grade, how sound travels through the medium is not appropriate as atoms and molecules are not introduced until grade 6. ***Future Application of Concepts*** Grades 6-8: The atomic nature of matter is introduced and energy is classified as kinetic and potential. Waves are introduced. Energy transfer and transformation and conservation of energy are explored further. High School: The wave nature of light and sound is expanded upon including mathematical analysis of wavelength, frequency and speed, and the Doppler effect.
Content Vocabulary • absorb • concave lenses • convex lenses • focal point • frequency • medium • opaque • pitch • reflect • refract • sound wave	**Academic Vocabulary** • analyze • appear • appearance • apply • articulate • assemble • characteristics • chart • clarify • classify • compare • example • exchange • graph • graphic • hypothesize • identify • illustrate • influence • interaction • interdependencies • interdependent

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- translucent
- transparent
- vibration
- volume

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- complete
- components
- conclude
- continual
- contrast
- correlate
- demonstrate
- depict
- detect
- determine
- differentiate
- dynamic relationships
- emit
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- interrelationships
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- simulation
- stability
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- transfer
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Formative Assessments

- Common Formative Assessments via Portal, Science Journals, Labs

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Summative Assessments

- Quizzes, Tests, Science Journals, Labs, Musical Instrument Project (paper, instrument, and presentation)

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Resources

- Gizmos (explorelearning.com) Color and Heat Absorption, Hearing Frequency and Sound (whole group demo suggested)
- Focus Curriculum Leveled Reader Booklets: What is Light, What is Sound
- Reading A-Z : How Sound Works, Level U
- Reading A-Z: Telescope Eyes on Space, Level Z

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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
- Reading A-Z Thomas Edition (comprehension)

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Integrations

- **ELA**: Reading A-Z: How Sound Works, Level U (main idea), Focus Curriculum
- Reading A-Z: Telescope Eyes on Space, Level Z (KWL, main idea, abbreviation, hyphens)
- **Math**: Reading A-Z: How Sound Works (graph)
- **Social Studies**:

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Intervention Strategies

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

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