

Science / 5th Grade

Earth and Sun

Subject
Science

Grade
5

Unit
Earth and Sun

Suggested Timeline
11 Weeks

Grade Level Summary

The 5th grade science curriculum focuses on giving student a broad understanding of Earth and Space. The focus is on physical science, earth science, life/biological science, technology, and engineering education, and crosscutting concepts. Students will experience an inquiry based learning approach using observation and scientific method encourages collaboration, critical thinking, creativity, and communication.

Grade Level Units

5th Grade Earth and Space

Unit Title

Earth and Sun

Unit Summary

Earth is the third planet from the Sun. It travels around the Sun in a nearly circular orbit at a distance of about 150 million kilometers. Earth is water rich, with 71% of the planet's surface covered with water. It is surrounded by a shallow atmosphere of nitrogen (78%) and oxygen (21%), and small amounts of a lot of other gases. The atmosphere extends about 500 kilometers (km) above Earth's surface, but most of the mass of the atmosphere is concentrated in the closest 9–20 km, the troposphere. The constant renewal of water on Earth's land surfaces by the activities in the atmosphere is one of the defining characteristics of Earth, the water planet. The **Earth and Sun Module** provides students with experiences to explore the properties of the atmosphere, energy transfer from the Sun to Earth, and the dynamics of weather and water cycling in Earth's atmosphere. Other experiences help students to develop and use models to understand Earth's place in the solar system, and the interactions of Earth, the Sun, and the Moon to reveal predictable patterns—daily length and direction of shadows, day and night, and the seasonal appearance of stars in the night sky. Students gain experiences that will contribute to the understanding of crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; systems and system models; and energy and matter.

Unit Essential Questions

1. What is the universe, and what is Earth's place in it?
2. How and why is Earth constantly changing?
3. How do Earth's processes and human activities affect each other?

Key Understandings

1. The universe is composed of a variety of different objects, which are organized into systems each of, which develops according to accepted physical processes and laws.
2. The Earth is a complex and dynamic set of interconnected systems, (e.g., geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales.
3. The Earth's processes affect and are affected by human activities.

Focus Standards Addressed in the Unit

3.1.5.A2

Describe how life on earth depends on energy from the sun.

3.3.5.A1

Describe how landforms are the result of a combination of destructive forces such as erosion and constructive erosion, deposition of sediment, etc.

3.3.5.A3	Explain how geological processes observed today such as erosion, movement of lithospheric plates, and changes in the composition of the atmosphere are similar to those in the past.
3.3.5.A5	Differentiate between weather and climate. Explain how the cycles of water, both in and out of the atmosphere, has an effect on climate.

Important Standards Addressed in the Unit

ESS1.A	The Universe and its Stars The Sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their size and distance from Earth
PS1.A	Structure and Properties of Matter Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects.
ESS2.A	Earth Materials and Systems Earth's major systems are the geosphere, the hydrosphere, the atmosphere, and the biosphere. These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather.

Misconceptions	Proper Conceptions
- Water is only found in streams, rivers, lakes, ponds, and oceans. - Air does not have mass. - Air and water are not important to sustaining life. - There is not a rhyme or reason to the solar systems and the objects surrounding the earth. - The sun does not have any bearing on the weather and climate. - Climate is our weather. - The earth and people are not really affected by global warming. - We see the same things in the sky no matter our seasons.	- The hydrosphere has properties that can be observed and quantified. - The atmosphere has properties that can be observed and quantified. - Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resource. - Earth is part of a planetary system in the universe. - Weather and climate are influenced by interactions of the Sun, the ocean, the atmosphere, ice, landforms, and living things. - Earth's climate and human activities affect each other. - The orbits of Earth around the Sun and of the Moon around Earth, together with the rotation of Earth about its axis between its North and South Poles, cause observable patterns

Concepts	Competencies	Vocabulary
- The sun is a star that appears larger and brighter than other stars because it is closer. (ESS1.A) - Stars range greatly in their distance from Earth. (ESS1.A) - The orbits of Earth around the sun and the moon around Earth, together with rotation of Earth about an axis between its north and South Poles, cause observable patterns (e.g., day and night, length and direction of	- Support an argument that the apparent brightness of the sun and stars is due to their relative distances from Earth. (5-ESS1-1) - Support an argument that the apparent brightness of the sun and stars is due to their relative distances from Earth. (5-ESS1-1) - Represent data in graphical displays to reveal patterns of daily changes in the length and direction of	Relative Distance Stars Sun Apparent Brightness Earth Data Graphical Display Patterns

shadows, different positions of sun, moon, and stars). (ESS1.B) • All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. The energy is derived from the sun and the earth's interior. These flows and cycles produce chemical and physical changes in Earth's materials and living organisms. (ESS2.A) • Earth's major systems are the geosphere, hydrosphere, and biosphere, which interact in multiple ways to affect the Earth's surface materials and processes. (ESS2.A) • The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. (ESS2.A) • Wind and clouds in the atmosphere interact with the landforms to determine patterns of weather. (ESS2.A) • Most fresh water is in glaciers or underground with the remainder in streams, lakes, wetlands, and atmosphere. (ESS2.C) • Investigate movement of water in among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation as well as downhill flows on land. (ESS .C) • Human activities in agriculture, industry, and everyday life have had major effects on land, vegetation, streams, ocean, and air. (ESS3.C)	shadows day and night, and seasonal appearance of stars in the sky. (5-ESS1-2) • Construct and analyze models to describe systems interactions among the geosphere, hydrosphere, atmosphere, and biosphere. (5-ESS2-1) • Through the creation of a model, explain the chemical and physical processes that cycle earth materials and form rocks. (5-ESS2-1) • Develop a model to describe the ways the geosphere, hydrosphere, and biosphere interact. This could include the influence of atmosphere on landforms and ecosystems though weather and climate, mountain ranges on winds and clouds, etc. (5-ESS2-1) • Develop a model to describe the ways the geosphere, hydrosphere and biosphere interact. (5-ESS2-1) • Utilizing observations and data, explain the patterns of weather in a given location. (5-ESS2-1) • Using real time data, graph amounts of water in various reservoirs to provide evidence about the distribution of water on earth. (5-ESS2-2) • Investigate movement of water in the Earth's systems and research and develop models for the cycling of water. (5-ESS2 -2) • Research and communicate how communities are using science to protect resources and environments. (5-ESS3-1)	Representation Shadows Atmosphere Biosphere Chemical change Energy flow Geosphere Hydrosphere Model Physical change Weather Distribution Precipitation Transpiration Water cycle Water system Human impact Research resources
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Assessments:

- Survey/Posttest
- Investigation 1 I-Check Earth and Sun
- Investigation 2 I-Check Earth and Sun
- Investigation 3 I-Check Earth and Sun
- Investigation 4 I-Check Earth and Sun

Suggested Strategies to Support Design of Coherent Instruction

Charlotte Danielson's Framework for Teaching: Domain 3 Instruction

- Science notebook entries
- Apply knowledge of science and technology in public discussion on relevant issues in a changing world.
- Conduct investigations individually and collaboratively to answer questions.
- Validate scientific claims for validity.
- Think systematically.

Differentiation:

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- Scaffolded notes
 - Provide multiple means of representation. Give learners various ways to acquire information and knowledge.
 - Provide multiple means of action and expression. Offer students alternatives for demonstrating what they know.
 - Provide multiple means of engagement. Help learners get interested, be challenged, and stay motivated.
 - Use new media and technologies to improve instruction.
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Interdisciplinary Connections:

- See FOSS and Common Core ELA-Grade 5 Guide.
 - See FOSS and Common Core Math-Grade 5 Guide.
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Additional Resources:

- Digital-Only Resources (www.fossweb.com)
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Created By: Ashleigh DeLuca, Jill Jahn, Julie Shrader



Science / 5th Grade

Mixtures & Solutions

Subject
Science

Grade
5

Unit
Mixture & Solutions

Suggested Timeline
10 weeks

Grade Level Summary

The 5th grade science curriculum focuses on giving students a broad understanding of physical science. The focus is on physical science, earth science, life/biological science, technology, and engineering education, crosscutting concepts. Students will experience an inquiry based learning approach using observation and scientific method that encourages collaboration, critical thinking, creativity, and communication.

Grade Level Units

Unit Title

Mixtures & Solutions

Unit Summary

Chemistry is the study of the structure of matter and the changes or transformations that take place within those structures. Learning about the properties and behaviors of substances and systems of substances gives us knowledge about how things go together and how they can be taken apart and gives us the opportunity to use and develop models that explain phenomena too small to see directly. Learning about changes in substances can lead to the development of new materials and new ways to produce energy and resources such as clean drinking water. The **Mixtures and Solutions Module** has five investigations that introduce students to fundamental ideas about matter and its interactions. Students come to know that matter is made of particles too small to be seen and develop the understanding that matter is conserved when it changes state—from solid to liquid to gas—when it dissolves in another substance, and when it is part of a chemical reaction. Students have experiences with mixtures, solutions of different concentrations, and reactions forming new substances. They also engage in engineering experiences with separation of materials. Students gain experiences that will contribute to the understanding of crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; systems and system models; and energy and matter.

Unit Essential Questions

1. How can one explain the structure, properties, and interactions of matter?
2. How are waves used to transfer energy and information?

Key Understandings

- Matter can be understood in terms of the types of atoms present and the interactions both between and within atoms.
- Waves are a repeating pattern of motion that transfers energy from place to place without overall displacement of matter.

Focus Standards Addressed in the Unit

3.2.5.A1.	Describe how water can be changed from one state to another by adding or taking away heat.
3.2.6.A2.	Compare and contrast pure substances with mixtures.
3.2.6.A4.	Differentiate between physical changes and chemical changes.

3.2.6.A5.	Constancy and change: Identify characteristic properties of matter that can be used to separate one substance from the other.
3.2.6.B6.	Scale: Investigate that materials may be composed of parts too small to be seen without magnification.

Important Standards Addressed in the Unit

PS1.A	Structures and Properties of Matter - Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. - The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. - Measurements of a variety of properties can be used to identify materials.
PS1.B	Chemical Reactions - When two or more different substances are mixed, a new substance with different properties may be formed. - No matter what reaction or change in properties occurs, the total weight of the substances does not change.
ETS1.A	Defining and Delimiting Engineering Problems Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.

Misconceptions - Objects are not made of matter too small to be seen - Changing states of matter means changing the object - Separation of materials means new materials	Proper Conceptions - Matter is made of particles too small to be seen - Develop the understanding that matter is conserved when it changes state—from solid to liquid to gas—when it dissolves in another substance, and when it is part of a chemical reaction - Experiences with mixtures, solutions of different concentrations, and reactions forming new substance. - Engineering experiences with separation of materials
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Concepts - When two or more different substances are mixed, a new substance with different properties may be formed. - Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means.	Competencies - Plan and conduct an investigation to determine whether the mixing of two or more substances results in new substances (e.g., cooking, baking, burning, etc.).(5-PS1-4) - Develop a model to describe that matter is made of particles too small to be seen.(5-PS1-1) - Make observations and measurements to identify given	Vocabulary Chemical change vs. physical change Mass Temperature Volume Condensation Evaporation Matter Particles Hardness Mass Moh's scale Porosity
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- Measurements of a variety of properties can be used to identify materials. - The amount of matter is conserved when it changes form. - When two or more different substances are mixed, a new substance with different properties may be formed; such occurrences depend on the substances and the temperature. - No matter what reaction or change in properties occurs, the total mass of the substances does not change.	materials based on their properties.(5-PS1-3) - Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total mass of matter is conserved.(5-PS1-2) - Investigate the interaction of two or more substances to provide evidence that when different substances are mixed, one or more new substances with different properties may or may not be formed. (5-PS1-4) - Plan and carry out investigations to determine the effect on the total mass of a substance when the substance changes shape, phase, and/or is dissolved. (5-PS1-2)	Properties Solubility Streak tests Volume Conservation of mass Mixtures vs. compounds Dissolve
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Assessments:

Survey/Posttest Mixtures and Solutions

- Investigation 1 I-Check Mixtures and Solutions
 - Investigation 2 I-Check Mixtures and Solutions
 - Investigation 3 I-Check Mixtures and Solutions
 - Investigation 4 I-Check Mixtures and Solutions
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Suggested Strategies to Support Design of Coherent Instruction

Charlotte Danielson's Framework for Teaching: Domain 3 Instruction

- Science notebook entries
 - Active investigation, firsthand experiences with objects, organisms, and materials in the natural and designed worlds
 - Recording in science notebooks to answer the focus question
 - Reading in FOSS Science Resources books
 - Online activities to review or extend the investigation
 - Outdoor experiences to collect data from the local environment or apply knowledge
 - Assessment to monitor progress and motivate student learning
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Differentiation:

- Scaffolded Notes
 - Provide multiple means of representation. Give learners various ways to acquire information and knowledge.
 - Provide multiple means of action and expression. Offer students alternatives for demonstrating what they know.
 - Provide multiple means of engagement. Help learners get interested, be challenged, and stay motivated.
 - Use new media and technologies to improve instruction.
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Interdisciplinary Connections:

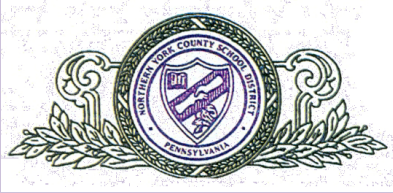
- See FOSS and Common Core ELA-Grade 5 Guide
- See FOSS and Common Core Math- Grade 5 Guide
- See Teacher's Masters for interdisciplinary worksheets

Additional Resources:

- Digital-Only Resources (www.fossweb.com)

Created By:

Jill Jahn, Julie Shrader, and Ashleigh DeLuca



Science / 5th Grade

Living Systems

Subject
Science

Grade
5

Unit
Living Systems

Suggested Timeline
10 Weeks

Grade Level Summary

The 5th grade science curriculum focuses on giving students a broad understanding of biological sciences. The focus is on physical science, earth science, life/biological science, technology, and engineering education, crosscutting concepts. Students will experience an inquiry based learning approach using observation, scientific method that encourages collaboration, critical thinking, creativity, and communication.

Grade Level Units

5th Living Systems

Unit Title

Living Systems Module

Unit Summary

The Living Systems Module has four investigations that focus on systems as the unit of study. The idea of a system is one of the grand integrating (crosscutting) concepts that pervades all of science. Students start by looking at Earth as the interaction of four Earth systems or subsystems—the geosphere, the atmosphere, the hydrosphere, and the biosphere. The focus of the module then turns to the biosphere as students explore ecosystems and organisms in terms of their interacting parts.

In this module, students think about systems on different scales— nutrient and transport systems within an organism that moves matter and provides energy to the individual organism, and feeding relationships in ecosystems that move matter among plants, animals, decomposers, and the environment. Students come to understand through a variety of experiences that plants get the materials they need for growth primarily from water and air, and that energy in animals' food was once energy from the Sun. There are many opportunities for students to explore how human activities in agriculture, industry, and everyday life can have major effects on these systems. Students gain experiences that will contribute to the understanding of crosscutting concepts of patterns; scale, proportion, and quantity; systems and system models; and energy and matter.

Unit Essential Questions

1. How do organisms live, grow, respond, to their environments, and reproduce?
2. How and why do organisms interact with their environment and what are the effects of these interactions?

Key Understandings

- All organisms are made of cells and can be characterized by common aspects of their structure and functioning.
- All organisms are made of cells and can be characterized by common aspects of their structure and functioning.
- Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment.

Focus Standards Addressed in the Unit

4.1.5.A. Describe the role of producers, consumers, and decomposers, within a local ecosystem.

4.1.5.C. Describe different food webs including a food web containing humans.

4.4.5.A.	Explain why animal production is dependent upon plant production.
4.4.5.C.	Investigate the factors influencing plant and animal growth. (e.g. soil, water, nutrients, and light)

Important Standards Addressed in the Unit

PS3.D:	Energy in chemical processes and everyday life The energy released from food was once energy from the Sun that was captured by plants in the chemical processes that forms plant matter (from air and water).
LS1.C:	Organization for matter and energy flow in organisms Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion.
LS2.A:	Interdependent relationships in ecosystems The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as “decomposers.” Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.
LS2.B:	Cycles of matter and energy transfer in ecosystems Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases and water from the environments, and release waste, matter (gas, liquid, or solid) back into the environments.

Misconceptions	Proper Conceptions
- Parts of an ecosystem work independently and don't relate to each other. - Human actions do not have an impact on the surrounding environment. - Human body system work independently within the body to move matter. - Energy is lost after humans and animals consume food.	- Parts of a system have interactive parts and may have subsystems. - Human activities in agriculture, industry, and everyday life can have major effects on living systems. - Nutrient and transport systems within an organism move matter and provide energy to the individual organisms. - Feeding relationships in ecosystems move matter among plants, animals, decomposers, and the environment.

Concepts	Competencies	Vocabulary
- Food provides animals with materials needed for body repair and growth. (PS3.D) - Food provides animals with materials needed for energy and to maintain body warmth and for motion. (LS1.C) - Plants acquire their materials for growth primarily from air and water. (LS1.C) - Animals and plants alike take in gases and water and release waste matter into the environment; animals must take in food, and	- Use a model to describe that energy in animal's food was once energy from the sun. (5-PS3-1) - Use a model to describe that energy in animal's food was once energy from the sun. (5-PS3-1) - Using evidence, present an argument that plants get the materials they need for growth primarily from air and water. (5-PS3-1) - Construct and communicate models of food webs that demonstrate the transfer of matter and energy among	Food chain Food web Argument Evidence Minerals Ecosystem Researchable Species Web of life Transfer energy Invasive Noninvasive Species

plants need light and minerals. (LS2.B) - Organisms can survive only in environments in which their particular needs are met. (LS2.A) - A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. (LS2.A) - Newly introduced species can damage the balance of an ecosystem. (LS2.A) - Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. (LS2.B) - A healthy ecosystem is one in which multiple species of different types are each able meet their needs in a relatively stable environment. (LS2.A)	organisms within an ecosystem. (5-LS2-1) - Ask researchable questions about the ways organisms obtain matter and energy across multiple and varied ecosystems. (5-LS2-1) - Construct a model of a food web to demonstrate the transfer of matter and energy among organisms within an ecosystem. (5-LS2-1) - Identify a newly introduced species to an ecosystem and provide evidence that it is an invasive species or noninvasive species. (5-LS2-1) - Use models to trace the cycling of particles of matter between the air and soil and among plants, animals, and microbes. (5-LS2-1) - Use models to describe how decomposition eventually restores (recycles) some materials back to the soil for plants to use. (5-LS2-1) - Describe a healthy ecosystem as a system in terms of the components and interactions. (5-LS2-1)	System Cycles Matter Microbes Decomposers Decomposition Microbes Components System models
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Assessments:

- Survey/PostTest: Living Systems
- Investigation 1 I Check: Living Systems
- Investigation 2 I Check: Living Systems
- Investigation 3 I Check: Living Systems

Suggested Strategies to Support Design of Coherent Instruction

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- Outdoor experiences to collect data from the local environment or apply knowledge
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