# Fairfield Public Schools
# Science Curriculum

## Grade 5

# Grade 5: Description

The elementary science standards are driven by questions to spark curiosity, guide instruction, deepen investigation into phenomena, acquire rigorous content knowledge and enable students to transfer the knowledge of ideas in real-world situations and to design and find solutions to problems. In the performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the disciplinary core ideas in earth science, life science and physical science. The standards define what students should know about the most essential ideas in the major science disciplines. Cross-cutting concepts provide students with connections and intellectual tools that are related across the differing areas of disciplinary content and can enrich their application of practices and their understanding of core ideas. These standards also tie together the influence of engineering, technology, and science on society and the natural world.

There are three physical science disciplinary core ideas in grade five: 1) Matter and its Interactions, 2) Motion and Stability: Forces and Interactions, 3) Energy. There are two life science disciplinary core ideas: 1) From Molecules to Organisms: Structures and Processes, 2) Ecosystems: Interactions, Energy, and Dynamics. And, there are three earth science disciplinary core ideas: 1) Earth's Place in the Universe, 2) Earth's Systems, 3) Earth and Human Activity.

The fifth grade science performance expectations require that students examine patterns, cause and effect relationships, scale, proportion, and quantity through energy transfer and systems and system models. Through the development of a model using an example, students are able to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. They describe and graph data to provide evidence about the distribution of water on Earth. Students are able to describe that matter is made of particles too small to be seen through the development of a model. Students develop an understanding of the idea that regardless of the type of change that matter undergoes, the total weight of matter is conserved. Students determine whether the mixing of two or more substances results in new substances. Students are expected to develop an understanding of patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. Students develop an understanding of the idea that plants get the materials they need for growth chiefly from air and water. Using models, students can describe the movement of matter among plants, animals, decomposers, and the environment and that energy in animals' food was once energy from the sun. In the fifth grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, using mathematics and computational thinking, engaging in argument from evidence, and obtaining, evaluating, and communicating information; and to use these practices to demonstrate understanding of the core ideas.

## NGSS Standards

**SCIENCE AND ENGINEERING PRACTICES (SEP):**

**Developing and Using Models**

Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop a model to describe phenomena. (5-PS1-1)

**Planning and Carrying Out Investigations**

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (5-PS1-4)
- Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3)

**Using Mathematics and Computational Thinking**

Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.

- Measure and graph quantities such as weight to address scientific and engineering questions and problems. (5-PS1-2)

---

**CROSS-CUTTING CONCEPTS (CCC):**

**Cause and Effect**

- Cause and effect relationships are routinely identified, tested, and used to explain change. (5-PS1-4)

**Scale, Proportion, and Quantity**

- Natural objects exist from the very small to the immensely large. (5-PS1-1)
- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1-2), (5-PS1-3)

# Grade 5: Overview

## Essential Understandings

- Everything in the universe is made of matter. Matter is made of particles that cannot be seen.
- All matter contains energy. Energy can be stored or transferred but it cannot be destroyed.
- Organisms, Earth systems, and space systems constantly interact with one another and are interdependent.
- Human activity on Earth can be analyzed through cause and effect relationships between humans and the Earth/Space Systems.
- Standard units of measurement are used to quantify energy transfers on the largest and smallest of scales.

## Course Essential Questions

- How do the different systems of the Earth interact with each other?
- How do these interactions affect the Earth's surface?
- If something is too small to be seen, how can it be detected and measured?
- What occurs when two or more different substances are combined?
- How do the different systems of the Earth and space interact with each other?
- How does matter and energy cycle through the ecosystem?
- How do the structures of organisms enable them to survive and interact in their environments (ecosystem)?
- What role do humans play in ecosystem?

# Grade 5: Year-at-a Glance

| Unit | Title | Unit Essential Questions |
|---|---|---|
| 1 | Earth Systems | • How do the different systems of the Earth interact with each other?<br>• How do these interactions affect the Earth's surface? |
| 2 | Structure/properties of matter and Space Systems | • If something is too small to be seen, how can it be detected and measured?<br>• What occurs when two or more different substances are combined?<br>• How do the different systems of the Earth and space interact with each other? |
| 3 | Matter and energy in organisms and ecosystems | • How does matter and energy cycle through the ecosystem?<br>• How do the structures of organisms enable them to survive and interact in their environments (ecosystem)?<br>• What role do humans play in ecosystem? |

# Unit Earth's Systems

## Overview

The Earth is made up of four major systems that interact in multiple ways. These systems are geosphere (solid and molten rock, soil, and sediments), biosphere (living things including humans), hydrosphere (water and ice) and/or atmosphere (air). These systems interact in multiple ways to affect Earth's surface materials and processes. Students look at the distribution of water on Earth and how it supports a variety of ecosystems and organisms, shapes landforms, and affects climate. Human activities in agriculture, industry, and everyday life have had major effects on land, vegetation, streams, oceans, air, and even outer space. Individuals in communities are doing things to help protect the Earth's resources and its environment.

## Unit Performance Expectations

At the conclusion of this unit, students will be able to:

**5-ESS2-1.** Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

**5-ESS2-2.** Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.

**5-ESS3-1.** Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment**.**

## Unit Essential Questions

- How do the different systems of the Earth interact with each other?
- How do these interactions affect the Earth's surface?

## NGSS Unit Standards

**DISCIPLINARY CORE IDEAS (DCI):**

**ESS2.A: Earth Materials and Systems**

- Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The oceans support 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. (5-ESS2-1)

**ESS2.C: The Roles of Water in Earth's Surface Processes**

- Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (5-ESS2-2)

**ESS3.C: Human Impacts on Earth Systems**

- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)

**SCIENCE AND ENGINEERING PRACTICES (SEP):**

- Developing and Using Models
- Using Mathematics and Computational Thinking
- Obtaining, Evaluating, and Communicating Information

**CROSS-CUTTING CONCEPTS (CCC):**

- Scale, Proportion, and Quantity
- Systems and System Models

**Corresponding Connecticut Core Standards:**

Common Core State Standards Connections:

ELA/Literacy –

**RI.5.7** Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-ESS2-1),(5-ESS2-2)

**W.5.8** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-ESS2-2)

**SL.5.5** Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-ESS2-1),(5-ESS2-2)

Mathematics –

**MP.2** Reason abstractly and quantitatively. (5-ESS2-1),(5-ESS2-2)

**MP.4** Model with mathematics. (5-ESS2-1), (5-ESS2-2)

**5.G.A.2** Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS2-1)

# Unit Structure and Properties of Matter and Space systems

## Overview

Within the Structure and Properties of Matter and Space Systems unit, students will begin this unit by discovering that matter is made up of tiny particles too small to be seen. A model, such as an inflated balloon, can be used to show that gases are made from particles that are too small to be seen and move freely around in space. Students develop an understanding that regardless of the type of change that matter undergoes, the total weight is conserved. Matter can be classified according to a number of different properties. The mixing of two or more substances results in a new substance that contains different properties. Then will have an introduction of the concept of gravity as it relates to objects near the Earth's surface as well as the Earth's position in space. The Earth is viewed as a system within the larger Solar System. The Earth and the Solar System interact in several ways and result in many observable patterns such as, day and night, daily changes in the direction and length of shadows, different positions of the sun, moon, and stars during different times of the day, month and year, seasonal changes, and tidal forces.

## Unit Performance Expectations

At the conclusion of this unit, students will be able to:

**5-PS1-1.** Develop a model to describe that matter is made of particles too small to be seen.
**5-PS1-2.** Measure and graph quantities to provide evidence that regardless of the type of change that occurs, the total weight is conserved.
**5-PS1-3.** Make observations and measurements to identify materials based on their properties.
**5-PS1-4.** Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
**5-PS2-1.** Support an argument that the gravitational force exerted by Earth on objects is directed down.
**5-ESS1-1.** Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.
**5-ESS1-2.** Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

## Unit Essential Questions

- If something is too small to be seen, how can it be detected and measured?
- What occurs when two or more different substances are combined?
- How do the different systems of the Earth and space interact with each other?

## NGSS Unit Standards

**DISCIPLINARY CORE IDEAS (DCI):**

**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. (5-PS1-1)
- The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2)
- Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3)

**PS1.B: Chemical Reactions**

- When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)
- No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (5-PS1-2)

**PS2.B:** Types of Interactions

- The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (5-PS2-1)

**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 distance from Earth. (5-ESS1-1)

**ESS1.B**: Earth and the Solar System

- The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. (5-ESS1-2)

**SCIENCE AND ENGINEERING PRACTICES (SEP):**

- Developing and Using Models
- Planning and Carrying Out Investigations
- Using Mathematics and Computational Thinking
- Analyzing and Interpreting Data Analyzing data
- Engaging in Argument from Evidence

**CROSS-CUTTING CONCEPTS (CCC):**

- Patterns
- Cause and Effect
- Scale, Proportion, and Quantity

**Corresponding Connecticut Core Standards:**

ELA/Literacy –

**RI.5.1** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-PS2-1),(5-ESS1-1)

**RI.5.7** Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-PS1-1) (5-ESS1-1)

**RI.5.8** Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s). (5-ESS1-1)

**RI.5.9** Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-PS2-1),(5-ESS1-1)

**W.5.1** Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-PS2-1),(5-ESS1-1)

**W.5.7** Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (5-PS1-2), (5-PS1-3),(5-PS1-4)

**W.5.8** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-PS1-2),(5-PS1-3),(5-PS1-4)

**W.5.9** Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-PS1-2),(5-PS1-3),(5-PS1-4)

**SL.5.5** Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5- ESS1-2)

Mathematics –

**MP.2** Reason abstractly and quantitatively. (5-PS1-1),(5-PS1-2),(5-PS1-3) (5-ESS1-1),(5-ESS1-2)

**MP.4** Model with mathematics. (5-PS1-1),(5-PS1-2),(5-PS1-3) (5-ESS1-1),(5-ESS1-2)

**MP.5** Use appropriate tools strategically. (5-PS1-2),(5-PS1-3)

**5.NBT.A.1** Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-PS1-1)

**5.NBT.A.2** Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-ESS1-1)

**5.NF.B.7** Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (5-PS1-1)

**5.MD.A.1** Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems. (5-PS1-2)

**5.MD.C.3** Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5-PS1-1)

**5.MD.C.4** Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. (5-PS1-1)

Mathematics –

**5.G.A.2** Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context. (5-ESS2-1)

# Unit Matter and Energy in Organisms and Ecosystems

## Overview

In this unit, Matter and Energy In Organisms and Ecosystems, the energy in animals' food was once energy from the sun. Plants capture energy from the sun using a chemical process. Plants acquire their material for growth primarily from the air and the water. Food provides animals with the materials they need for body repair, growth, and for the energy they need to maintain temperature and motion. 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 (e.g. bacteria) break down dead organisms and therefore operate as "decomposers." The idea of ecosystems is explored, with a discussion of what makes an ecosystem healthy or unhealthy. Humans are constantly exerting influence on ecosystems that result in changes.

## Unit Performance Expectations

At the conclusion of this unit, students will be able to:

**5-PS3-1.** Use models to describe that the energy in animals' food was once energy from the sun.

**5-LS1-1.** Support an argument that plants get the materials they need for growth primarily from the sun, the air, and water.

**5-LS2-1.** Develop a model that shows how a system is interdependent and the movement of matter among plants, animals, decomposers, and the environment occurs in cycles.

## Unit Essential Questions

- How does matter and energy cycle through the ecosystem?
- How do the structures of organisms enable them to survive and interact in their environments (ecosystem)?
- What role do humans play in ecosystem?

## NGSS Unit Standards

**DISCIPLINARY CORE IDEAS (DCI):**

**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 process that forms plant matter (from air and water). (5-PS3-1)

**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. (secondary to 5-PS3-1)

Plants acquire their material for growth chiefly from air and water. (5-LS1-1)

**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. (5-LS2-1)

**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 environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1)

**SCIENCE AND ENGINEERING PRACTICES (SEP):**

- Developing and Using Models Modeling
- Develop a model to describe phenomena
- Engaging in Argument from Evidence
- Support an argument with evidence, data, or a model

**CROSS-CUTTING CONCEPTS (CCC):**

- Systems and System Models
- Energy and Matter

**Corresponding Connecticut Core Standards:**
ELA/Literacy –
**RI.5.1** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-ESS3-1)
**RI.5.7** Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-ESS2- 1),(5-ESS2-2),(5-ESS3-1)
**RI.5.9** Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-ESS3-1)
**W.5.8** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (5-ESS2-2),(5-ESS3-1)
**W.5.9** Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-ESS3-1)
**SL.5.5** Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5- ESS2-1),(5-ESS2-2) Mathematics –
**MP.2** Reason abstractly and quantitatively. (5-ESS2-1),(5-ESS2-2),(5-ESS3-1)
**MP.4** Model with mathematics. (5-ESS2-1),(5-ESS2-2),(5-ESS3-1)
**5.G.2** Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS2-1)