Fairfield Public Schools
Science Curriculum

Draft
Grade 6
March 12, 2018

Grade 6 Science: Description

Grade 6 Science is the study of Earth Science. It is concerned with the relationship between Earth's systems and all living things. An understanding of these concepts is essential for individuals to make informed choices with regard to the environment and advancing scientific technology. Some of the topics covered are: Space Systems, Earth's Systems, Weather & Climate, and Human Impact.

Standards for this course are taken from the *Next Generation Science Standards* and are of three types:

Disciplinary Core Ideas (DCIs): Shown as content objectives, these standards define what students should know about the most essential ideas in the major science disciplines. The focus is on a limited number of core ideas in science and engineering both within and across the disciplines to avoid the shallow coverage of a large number of topics and to allow more time for teachers and students to explore each idea in greater depth. Reduction of the sheer sum of details to be mastered is intended to give time for students to engage in scientific investigations and argumentation and to achieve depth of understanding of the core ideas presented.

Science and Engineering Practices (SEP): These standards enable students to apply the content in the DCI's and the skills of practicing scientists and engineers to explain phenomena and solve real world problems. Engaging in the practices of science helps students understand how scientific knowledge develops; such direct involvement gives them an appreciation of the wide range of approaches that are used to investigate, model, and explain the world. Engaging in the practices of engineering likewise helps students understand the work of engineers, as well as the links between engineering and science.

Crosscutting Concepts: These standards 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 broad concepts tie together the influence of engineering, technology, and science on society and the natural world.

http://www.nextgenscience.org/next-generation-science-standards

Grade 6 Science: Overview

Enduring Understandings
There are patterns in our solar system and in the universe that can be predicted using historical data. Human activities have had broad and significant impact on Earth's environments Geological forces and their hazards on different regions on the Earth, and can be used to forecast future events

Grade 6 Science: Year-at-a Glance

Unit	Title	Unit Essential Questions
1	Space Systems	● Why are models useful in understanding the patterns of our solar system? ● How does gravity affect our solar system and the universe?
2	History of Earth	● What evidence do we have that can help explain the history of the Earth? ● How do scientists gather and use this evidence?
3	Earth's Systems	● Why are some of Earth's resources limited and others are not?
4	Weather and Climate	● Why does the Earth's climate and weather change over time?
5	Human Impacts	● How can we use the information we have to develop ways to predict future catastrophes and to help mitigate them?

Unit 1: Space Systems

Overview

The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. Earth and its solar system are found in one of many galaxies in the universe. Models of the solar system can explain many phenomena we see.

Performance Expectations

MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system.

Unit Essential Questions

- What processes and information do scientists use to determine the size and distances of things in our solar system?
- What causes the patterns we see on Earth – lunar, seasons, and eclipses?

Crosscutting Concepts

Patterns

- Patterns can be used to identify cause and effect relationships. (MS-ESS1-1)

Systems and System Models

- Models can be used to represent systems and their interactions. (MS-ESS1-2)

NGSS Unit Standards

DISCIPLINARY CORE IDEAS (DCI):

ESS1.A: The Universe and Its Stars

- Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS- ESS1-1)
- Earth and its solar system are part of the Milky Way Galaxy, which is one of many galaxies in the universe. (MS-ESS1-2)

ESS1.B: Earth and the Solar System

- The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around

the sun by its gravitational pull on them. (MS-ESS1- 2),(MS-ESS1-3)

- This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1- 1)
- The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2)

SCIENCE AND ENGINEERING PRACTICES (SEP):

Analyzing and Interpreting Data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

- Analyze and interpret data to determine similarities and differences in findings. (MSESS3-2)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- Apply scientific principles to design an object, tool, process or system. (MS-ESS3-3)

Engaging in Argument from Evidence

Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

- Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-ESS3-4)

Corresponding CT Core Standards:

ELA/Literacy – RST.6-8.1, RST 6.8.7, WHST 6-8.1, WHST 6-8.7, WHST 6-8.8, WHST6-8.9

Mathematics – MP.2, 6.RPA.1. 7.RPA.2, 6.EE.B.6, 7.EE.B.4

Unit 2: History of Earth

Overview

The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.

Performance Expectations

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

MS-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.

MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

MS-ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

Unit Essential Questions

- What evidence do we have to explain how processes inside and outside the Earth have changed it over time?
- How can we use that evidence to support our hypotheses about the Earth's 4.6 billion year old history?

Crosscutting Concepts

Patterns

- Patterns in rates of change and other numerical relationships can provide information about natural systems. (MS-ESS2-3)

Scale Proportion and Quantity

- Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS2-2

NGSS Unit Standards

DISCIPLINARY CORE IDEAS (DCI):

ESS1.C: The History of Planet Earth

- The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1- 4)
- Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (HS.ESS1.C GBE) (secondary to MS- ESS2-3)

ESS2.A: Earth's Materials and Systems

- The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (MS-ESS2-2)

ESS2.B: Plate Tectonics and Large-Scale System Interactions

- Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (MS-ESS2-3)

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

- Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (MS-ESS2-2)

SCIENCE AND ENGINEERING PRACTICES (SEP):

Analyzing and Interpreting Data

- Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
- Analyze and interpret data to provide evidence for phenomena. (MS-ESS2-3)

Constructing Explanations and Designing Solutions

- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MSESS1-4),(MS-ESS2-2)

Corresponding CT Core Standards:

ELA/Literacy – RST.6-8.1, RST 6-8.2, RST 6.8.7, WHST 6-8.2, SL 8.5

Mathematics – MP.2, 6.EE.B.6, 7.EE.B.4

Unit 3: Earth's Systems

Overview

The energy that flows and matter that cycles through the Earth's systems produce chemical and physical changes in Earth's materials and living organisms. Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Some resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes.

Performance Expectations

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

MS-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.

MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

Unit Essential Questions

- Why are Earth's resources distributed differently around the world?
- Why do some parts of the world have more water than others?

Crosscutting Concepts

Stability and Change

- Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and processes at different scales, including the atomic scale. (MS-ESS2-1)

Energy and Matter

- Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. (MS-ESS2-4)

Cause and Effect

- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3- 1),(MS-ESS3-4)

NGSS Unit Standards

DISCIPLINARY CORE IDEAS (DCI):

ESS2.A: Earth's Materials and Systems

- All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS2-1)

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

- Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4)

ESS3.A: Natural Resources

- Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1)

SCIENCE AND ENGINEERING PRACTICES (SEP):

Developing and Using Models

- Develop and use a model to describe phenomena. (MS-ESS2-1)
- Develop a model to describe unobservable mechanisms. (MS-ESS2-4)

Constructing Explanations and Designing Solutions

- Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS- ESS3-1)

Corresponding CT Core Standards:

ELA/Literacy – RST.6-8.1, WHST.6-8.9, WHST.6-8.2, SL.8.5

Mathematics – 6.EE.B.6, 7.EE.B.4

Unit 4: Weather and Climate

Overview

Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. These patterns are so complex, that weather can only be predicted using probabilities.

Performance Expectations

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

MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.

MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

Unit Essential Questions

- How do the properties and movements of water shape Earth's surface and affect its systems?
- What regulates weather and climate?

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MSESS2- 5)

Systems and System Models

- Models can be used to represent systems and their interactions—such as inputs, processes and outputs and energy, matter, and information flows within systems. (MS-ESS2-6)

Stability and Change

- Stability might be disturbed either by sudden events or gradual changes that accumulate over time. (MS-ESS3-5)

NGSS Unit Standards

DISCIPLINARY CORE IDEAS (DCI):

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

- The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MS-ESS2-5)
- Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2- 6)

ESS2.D: Weather and Climate

- Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6)
- Because these patterns are so complex, weather can only be predicted probabilistically. (MS-ESS2-5)
- The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (MS-ESS2-6)

ESS3.D: Global Climate Change

- Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS-ESS3-5)

SCIENCE AND ENGINEERING PRACTICES (SEP):

Asking Questions and Defining Problems

- Ask questions to identify and clarify evidence of an argument. (MS-ESS3-5)

Developing and Using Models

- Develop and use a model to describe phenomena. (MSESS2-6)

Planning and Carrying Out Investigations

- Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. (MS-ESS2-5)

Corresponding CT Core Standards:

ELA/Literacy – RST.6-8.1, RST.6-8.9, WHST.6-8.8, SL.8.5

Mathematics – MP.2, 6NS.C.5, 6.EE.B.6, 7.EE.B.4

Unit 5: Human Impacts

Overview

Human activities can have different impacts (negative and positive) for different living things. Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events.

Performance Expectations

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

MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

Unit Essential Question

- How can we minimize the negative impacts to the Earth as we use the resources that we need?

Crosscutting Concepts

Patterns

- Graphs, charts, and images can be used to identify patterns in data. (MS-ESS3-2)

Cause and Effect

- Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3)
- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-1),(MS-ESS3-4)

NGSS Unit Standards

DISCIPLINARY CORE IDEAS (DCI):

ESS3.B: Natural Hazards

- Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. (MS-ESS3-2)

ESS3.C: Human Impacts on Earth Systems

- Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. (MS-ESS3-3)
- Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (MSESS3-3),(MS-ESS3-4)

SCIENCE AND ENGINEERING PRACTICES (SEP):

Analyzing and Interpreting Data

- Analyze and interpret data to determine similarities and differences in findings. (MS-ESS3-2)

Constructing Explanations and Designing Solutions

- Apply scientific principles to design an object, tool, process or system. (MS-ESS3-3)

Engaging in Argument from Evidence

- Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-ESS3-4)

Corresponding CT Core Standards:

ELA/Literacy – RST.6-8.1, RST.6-8.9, WHST.6-8.8, SL.8.5

Mathematics – MP.2, 6NS.C.5, 6.EE.B.6, 7.EE.B.4