6th Grade Unit 4 - Weather and Climate

Content Area: **Science**
Course(s): **Science Grade 6**
Time Period: **MP4**
Length: **45 days**
Status: **Published**

NJSLS - Science

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

Science and Engineering Practices

Developing and Using Models

Develop and use a model to describe phenomena. (MS-ESS2-6)

Develop a model to describe unobservable mechanisms. (MS-ESS2-4)

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)

Disciplinary Core Ideas

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

Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (MS-ESS2-4)

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)

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

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, 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)

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Crosscutting Concepts

Cause and Effect

Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS2-5)

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)

Energy and Matter

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

Rationale and Transfer Goals

This unit is broken down into three sub-ideas: Earth's large-scale systems interactions, the roles of water in Earth's surface processes, and weather and climate. Students make sense of how Earth's geosystems operate by modeling the flow of energy and cycling of matter within and among different systems. A systems approach is also important here, examining the feedbacks between systems as energy from the Sun is transferred between systems and circulates through the ocean and atmosphere. The crosscutting concepts of cause and effect, systems and system models, and energy and matter are called out as frameworks for understanding the disciplinary core ideas. In this unit, students are expected to demonstrate proficiency in developing and using models and planning and carrying out investigations as they make sense of the disciplinary core ideas. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Enduring Understandings

Earth's weather and climate systems are the result of complex interactions between land, ocean, ice, and atmosphere.

Scientists use weather variables to describe weather and study weather systems.

Climate is the long-term average weather conditions that occur in an area.

Essential Questions

How does water cycle into and through the atmosphere?

How does water cycle on Earth's surface?

How does energy transfer from the Sun to Earth and the atmosphere?

What causes air and water to flow?

How do the interactions of air masses cause changes in weather conditions?

What factors determine regional climates?

Content - What will students know?

- Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.
- Global movements of water and its changes in form are propelled by sunlight and gravity.
- The cycling of water through Earth's systems is driven by energy from the sun and the force of gravity.
- Within Earth's systems, the transfer of energy drives the motion and/or cycling of water.
- The motions and complex interactions of air masses result in changes in weather conditions.
- The complex patterns of the changes in and movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns and changes in weather conditions.
- Examples of data that can be used to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions include weather maps, diagrams, and visualizations; other examples can be obtained through laboratory experiments.
- Air masses flow from regions of high pressure to regions of low pressure, causing weather (defined by

temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time.

- Because patterns of the changes and the movement of water in the atmosphere are so complex, weather can only be predicted probabilistically.
- Sudden changes in weather can result when different air masses collide.
- Weather can be predicted within probabilistic ranges.
- Cause-and effect-relationships may be used to predict changes in weather.
- Unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
- Patterns of atmospheric and oceanic circulation that determine regional climates vary by latitude, altitude, and geographic land distribution.
- Atmospheric circulation that, in part, determines regional climates is the result of sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds.
- Ocean circulation that, in part, determines regional climates is the result of the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents.
- Models that can be used to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates can be diagrams, maps and globes, or digital representations.

Skills - What will students be able to do?

- Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
- Model the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle.
- Collect data to serve as the basis for evidence for how the motions and complex interactions of air masses result in changes in weather conditions.
- 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.

Activities - How will we teach the content and skills?

- Inspire Science Earth and Space Unit 2 Module 1: Lesson 1 Water in the Atmosphere

- Inspire Science Earth and Space Unit 2 Module 1: Lesson 2 Water on Earth's Surface
- Inspire Science Earth and Space Unit 2 Module 2: Lesson 1 Solar Energy on Earth
- Inspire Science Earth and Space Unit 2 Module 2: Lesson 2 Atmospheric and Oceanic Circulation
- Inspire Science Earth and Space Unit 2 Module 2: Lesson 3 Weather Patterns
- Inspire Science Earth and Space Unit 2 Module 2: Lesson 4 Climates of Earth
- MS-ESS2-4 Lesson Examples
- MS-ESS2-5 Lesson Examples
- MS-ESS-2-6 Lesson Examples

Evidence/Assessments - How will we know what students have learned?

- Inspire Science Labs
- Inspire Science STEM Module Projects
- Inspire Science Earth and Space Unit 2 Module 1 Assessment
- Inspire Science Earth and Space Unit 2 Module 2 Assessment
- Daily Warm Ups
- Daily Exit Tickets
- Grade 6 Unit 4 Benchmark Assessment

Spiraling for Mastery

Content or Skill for this Unit	Spiral Focus from Previous Unit	Instructional Activity
• Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. • Global movements of	By the end of Grade 5, students understand that: Most of the Earth's water is in the ocean, and much of the Earth's freshwater is in glaciers or underground.	5-ESS2-1 Activities 5-ESS2-2 Activities 3-ESS2-1 Activities

water and its changes in form are propelled by sunlight and gravity. • The cycling of water through Earth's systems is driven by energy from the sun and the force of gravity. • Weather can be predicted within probabilistic ranges. • Patterns of atmospheric and oceanic circulation that determine regional climates vary by latitude, altitude, and geographic land distribution. • Atmospheric circulation that, in part, determines regional climates is the result of sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds. • Ocean circulation that, in part, determines regional climates is the result of the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents.	Climate describes patterns of typical weather conditions over different scales and variations. Historical weather patterns can be analyzed.	3-ESS2-2 Activities

Key Resources

McGraw Hill Inspire Science

Air Masses

Ocean Currents and Sea Surface Temperature

Adopt a Drifter: Do Ocean Surface Currents Influence Climate?

Exploring the Water Cycle

The Ocean's Effect on Climate

The Ocean's Effect on Climate Part 2

Heat and Water

21st Century Life and Careers

WRK.9.2.8.CAP.8	Compare education and training requirements, income potential, and primary duties of at least two jobs of interest.

Career Readiness, Life Literacies, & Key Skills

TECH.9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
TECH.9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
TECH.9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).
TECH.9.4.8.CT.3	Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.
TECH.9.4.8.TL.1	Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.
TECH.9.4.8.TL.2	Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).
TECH.9.4.8.TL.3	Select appropriate tools to organize and present information digitally.
TECH.9.4.8.TL.4	Synthesize and publish information about a local or global issue or event (e.g., MSLS4-5, 6.1.8.CivicsPI.3).

TECH.9.4.8.IML.3	Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b).
TECH.9.4.8.IML.4	Ask insightful questions to organize different types of data and create meaningful visualizations.
TECH.9.4.8.IML.5	Analyze and interpret local or public data sets to summarize and effectively communicate the data.

Interdisciplinary Connections/Companion Standards

NJSLS ELA

RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS2-5)

RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ESS2-5)

WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. (MS-ESS2-5)

SL.8.5 Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. (MS-ESS2-6)

NJSLS Math

MP.2 Reason abstractly and quantitatively. (MS-ESS2-5)

6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-ESS2-5)