Unit 3: Earth Science - How is the Earth Changing?

Content Area: **TEMPLATE**
Course(s):
Time Period: **Full Year**
Length: **Type Length of Unit**
Status: **Published**

General Overview, Course Description or Course Philosophy

Science and engineering—significant parts of human culture that represent some of the pinnacles of human achievement—are not only major intellectual enterprises but also can improve people's lives in fundamental ways. Although the intrinsic beauty of science and a fascination with how the world works have driven exploration and discovery for centuries, many of the challenges that face humanity now and in the future—related, for example, to the environment, energy, and health—require social, political, and economic solutions that must be informed deeply by knowledge of the underlying science and engineering.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Earth Science What Makes the Weather Change?

Learning Set 1 What Causes a Storm? What is the universe, and what is Earth's place in it? How and why is Earth constantly changing? How do the properties and movements of water shape Earth's surface and affect its systems? What regulates weather and climate? How can one explain the structure, properties, and interactions of matter? How do particles combine to form the variety of matter one observes? What is energy? What is meant by conservation of energy? How is energy transferred between objects or systems?

Learning Set 2 Why Is Weather Different from Place to Place? What is the universe, and what is Earth's place in it? What is the universe, and what goes on in stars? How and why is Earth constantly changing? How do the properties and movements of water shape Earth's surface and affect its systems? What regulates weather and climate?

How does climate change impact our environment and impacts of natural hazards.

CONTENT AREA STANDARDS

6-8.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.
6-8.MS-PS3-5	Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
6-8.MS-PS1-4	Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
SCI.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.
SCI.MS-ESS1-2	Develop and use a model to describe the role of gravity in the motions within galaxies and

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

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

LA.WHST.6-8.1	Write arguments focused on discipline-specific content.
LA.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.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.
MA.7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
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.CI.2	Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3).
TECH.9.4.8.CI.3	Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).
TECH.9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries.
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.3	Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- Water continually cycles among land, ocean, and atmosphere via transpiration,

evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.

- 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.
- Global movements of water and its changes in form are propelled by sunlight and gravity.
- Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents.
- Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things.
- Because these patterns are so complex, weather can only be predicted probabilistically.
- 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.
- Gases and liquids are made of molecules or inert atoms that are moving about relative to each other.
- In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations.
- The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.
- The term “heat” as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another.
- The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system’s material).
- When the motion energy of an object changes, there is inevitably some other change in energy at the same time.
- Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models.
- Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents.
- Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things.
- 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.

Procedural Knowledge

Students will be able to:

- Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
- Collect data to provide evidence for how the motions and complex interactions of air masses results 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.
- Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
- Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
- 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.
- 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.

EVIDENCE OF LEARNING

Formative Assessments

MS - PS1-4:

Earth Science 2 – What Makes the Weather Change? Activity 2.2: A Little Heat from Me to You, Reading 2.2: Why Does Conduction Matter?, Activity 3.1: How Do Differences in Temperature Affect Air Masses?, Activity 3.2: What Happens When Air Is Heated or Cooled?

MS - PS3-5:

Earth Science 2 – What Makes the Weather Change? Activity 3.3: Why Heat Rises, Reading 3.3: Why Learn about Convection?

MS - ESS1-1:

Earth Science 2 – What Makes the Weather Change? Activity 7.3: Does the Earth's Shape Affect Temperature?, Activity 7.4: Does the Angle That Light Hits the Earth Affect Intensity?, Activity 7.5: Can We Explain the Pattern in the Data?, Reading 8.2: Day and Night, Activity 8.3: Does a Tilted Earth Explain the Seasons?, Reading 8.3: Seasons of the Year, Activity 8.4: Why Is the Temperature Not the Same Everywhere?

MS - ESS2-4:

Earth Science 2 – What Makes the Weather Change? Activity 4.3: Is a Storm Cloud Different from Other Clouds?

MS - ESS2-5:

Earth Science 2 – What Makes the Weather Change? Activity 1.2: Setting Up the Driving Question Board (DQB), Reading 1.2: What Can Clouds Tell Us about Weather?, Activity 2.1: It Is Heating Up, Activity 4.1: Constructing a Barometer, Activity 4.2: Does How Large the Difference in Temperature between Air Masses Affect How the Air Moves?, Activity 5.1: What Can Weather Maps Tell Us?, Reading 5.1: How Do Scientists Get the Data?, Activity 5.2: Creating an Isobar Map, Activity 6.1: Can We Identify Patterns in Data?, Activity 6.2: Can the Storm Model Explain the Data?, Reading 6.2: Is It Going to Snow or Rain or...?

MS - ESS2-6:

Earth Science 2 – What Makes the Weather Change? Activity 1.1: Identifying Weather Conditions around the World, Activity 7.1: How Can We Compare Cities on Earth?, Activity 7.2: Do the Number of Daylight Hours Vary in Different Locations on Earth?, Homework 7.5: Does the Data Match the Explanation?, Activity 8.1: Does the City Data Match the Visualizations?, Activity 8.2: How Does the Earth Move?

Summative Assessments

- Benchmark Assessments
    - Multiple Choice Assessment administered at the end of each marking period.

Alternative Assessments

- Oral Presentations
- Questions for Comprehension
- Performance Tasks
- Scientific Journals/Notebooks
- Self-Assessment
- WebQuests

RESOURCES (Instructional, Supplemental, Intervention Materials)

IQWST Unit Materials for Earth Science 3, Learning Sets 1 - 2

A Framework For K-12 Science Education

Onlne Resources provided by IQWST not included in the program (to be used as support/reinforcement/enrichment): https://docs.google.com/spreadsheets/d/1VpyFCL4_50_-1w2NhcGpdNNZ2jj6aJJegcIUNCy_uzQ/pubhtml

Climate Change:

- In Grade 7, Module 7.4, Learning Set 1, Lesson 2, Activity 2.1: Introducing the Trout Mystery, students engage in a learning sequence to determine the cause of change in the Great Lakes trout population. Students ask questions (SEP-AQDP-M1) to determine which environmental interactions could affect trout populations over time (CCC-SC-M1, DCI-LS2.A-M1). Climate change data is analyzed and used as evidence.

INTERDISCIPLINARY CONNECTIONS

Collaboration with Math and Language Arts teachers is an essential part of the IQWST curriculum.

Information Writing

Current Events

Topography

Data collection/analysis

Computations

Statistics

Enginereering

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.

IQWST provides audio recording for all readings in student workbook-available through teacher portal online

Reading differentiation strategies are embedded in the IQWST program and all students prepare for reading through a 'Getting Reading' section which begins each reading.

The sections are desgined to engage students, generate interest, activate prior knowledge and provide a purpose for reading. Teachers use advance organizers for desired readings and to encourage students to plan and annote the passages.

A word wall is developed through vocabulary aquisition in the program. Students develop the word wall as words are learned in context and through experience in class. This helps to build meaning and understanding which support students when reading text.

Students are encouraged to ask questions and post them to the Driving Question Board. This DQB helps students develp a greater level of understanding and encourages students to work together to solve problems in and outside of class.

Supoort will be provided to students when writing in the student manual and use of teh computer, printing, and pasting into the manual is acceptable if there is a present need.