Unit 2: Atmosphere, Weather, and Climate

Content Area: **Science**
Course(s):
Time Period: **Marking Period 2**
Length: **8-10 Weeks**
Status: **Published**

Brief Summary of Unit

As a result of this investigation, students will develop an understanding of the role, the function, and the characteristics of Earth's atmosphere. Students will understand the factors that contribute to air pollution, as well as the effects of atmospheric pollutants, both natural and human generated. Students will develop an understanding of weather and the relationship between the distribution and movement of air masses and landforms, ocean temperatures, and currents. Students will develop an understanding of how human activities are the major factors in global warming and how we can apply our knowledge of this to help reduce the level of climate change that is happening. Students will gain experience in making a persuasive presentation based on scientific evidence. They will improve their abilities to conduct scientific inquiries and make, record, and analyze observations and measurements. The crosscutting concepts of systems, system models, patterns and cause and effect will provide a framework for understanding the disciplinary core ideas. Students are expected to demonstrate proficiency in planning and carrying out investigations, analyzing and interpreting data, and developing and using models, Students are also expected to use these to use these science and engineering practices to demonstrate understanding of the disciplinary core ideas.

Revision Date: July 2020

PFL.9.1.2.FP.1	Explain how emotions influence whether a person spends or saves.
LA.L.6.2.B	Spell correctly.
LA.L.6.3	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
LA.L.6.4.A	Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.
LA.L.6.4.B	Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., audience, auditory, audible).
LA.L.6.4.C	Consult reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech.
LA.L.6.4.D	Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).
LA.L.6.6	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.
SCI.MS-ESS2-1	Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
SCI.MS.ESS2.A	Earth's Materials and Systems
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.C	The Roles of Water in Earth's Surface Processes

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.
SCI.MS.ESS2.D	Weather and Climate
SCI.MS-ESS3	Earth and Human Activity
SCI.MS.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.
SCI.MS.ESS3.B	Natural Hazards
SCI.MS-ESS3-3	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
SCI.MS.ESS3.C	Human Impacts on Earth Systems
SCI.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.
SCI.MS.ESS3.C	Human Impacts on Earth Systems
SCI.MS-ESS3-5	Ask questions to clarify evidence of the factors that have caused climate change over the past century.
SCI.MS.ETS1.C	Optimizing the Design Solution
SCI.MS.ETS1.B	Developing Possible Solutions
CS.6-8.8.1.8.DA.1	Organize and transform data collected using computational tools to make it usable for a specific purpose.
CS.6-8.8.1.8.DA.3	Identify the appropriate tool to access data based on its file format.
CS.6-8.8.1.8.DA.6	Analyze climate change computational models and propose refinements.
CS.6-8.8.2.8.EC.1	Explain ethical issues that may arise from the use of new technologies.
CS.6-8.8.2.8.ED.2	Identify the steps in the design process that could be used to solve a problem.
CS.6-8.8.2.8.ITH.2	Compare how technologies have influenced society over time.
CS.6-8.8.2.8.ITH.5	Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another.
WRK.9.2.8.CAP.10	Evaluate how careers have evolved regionally, nationally, and globally.
WRK.9.2.8.CAP.15	Present how the demand for certain skills, the job market, and credentials can determine an individual's earning power.
WRK.9.2.8.CAP.19	Relate academic achievement, as represented by high school diplomas, college degrees, and industry credentials, to employability and to potential level.
TECH.9.4.2.CI.1	Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).
TECH.9.4.2.DC.1	Explain differences between ownership and sharing of information.
TECH.9.4.2.TL.2	Create a document using a word processing application.
TECH.9.4.2.TL.3	Enter information into a spreadsheet and sort the information.
TECH.9.4.2.TL.6	Illustrate and communicate ideas and stories using multiple digital tools (e.g., SL.2.5.).
TECH.9.4.2.TL.7	Describe the benefits of collaborating with others to complete digital tasks or develop digital artifacts (e.g., W.2.6., 8.2.2.ED.2).

TECH.9.4.2.IML.2	Represent data in a visual format to tell a story about the data (e.g., 2.MD.D.10).
TECH.9.4.2.IML.3	Use a variety of sources including multimedia sources to find information about topics such as climate change, with guidance and support from adults (e.g., 6.3.2.GeoGI.2, 6.1.2.HistorySE.3, W.2.6, 1-LSI-2).

Essential Questions

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What regulates weather and climate?

How and why is Earth constantly changing?

How do Earths major systems interact?

How do people model and predict the effects of human activities on Earth's climate changes?

Enduring Understandings

Understand how to help reduce air pollution by conserving energy, recycling, reducing fossil fuel consumption, etc and propose solutions to global warming.

Understand why different regions of the world have different climates

Students Will Know/Students Will be Skilled At

Students will know the functions of Earth’s atmosphere

Students will know the difference between mass, density, and pressure

Students will know the correlation air pressure, temperature and density with altitude

Students will know the gases that make up our current atmosphere

Students will know the difference between Earth's ancient atmosphere with its current atmosphere

Students will know how to differentiate between the five layers of the atmosphere

Students will know the importance of the ozone layer

Students will know causes and effects of air pollution

Students will know ways to reduce air pollution globally and in their own lives

Students will know how to differentiate between weather and climate

Students will be skilled at identifying the factors that contribute to determining and predicting weather

Students will know how to identify different air masses and determine how/where they form.

Students will know the different types of fronts

Students will unnderstand that climate change can effect the Earths Atmosphere and Weather

Students will be skilled at describing the different types of weather instruments & how they are used to predict weather

Students will be skilled at connecting the importance of studying weather with our lives

Learning Plan

Atmosphere Composition →Demonstration: Without any discussion or background information students will complete a chart on the atmosphere to assess their prior knowledge. They will complete it individually first and then compare with their table. Students will then share their answers with the class, but the correct responses will not be shared. Students will discover their answers as we proceed through the chapter. →Notes/Discussion – students will take notes on the atmosphere, its functions and its importance *Guided notes &PowerPoints for students as needed*

Demonstration: Three candles will be placed under different sized beakers. Each candle will be lit and students will watch to see which candle burns out first, second, and third. Discussion Questions: What did you observe? Why did the candles burn out in that order? After watching this demonstration what can you infer about the composition of the atmosphere? What do candles need to burn? What did this experiment prove?

Demonstration/Discussion: Lead discussion by asking students about atoms and mass. Discussion Questions:What is matter? What is mass? What has mass? How do we measure mass? Does everything have mass? Does "air" have mass??? These questions will lead to a poll of the class, usually divided, on whether or not "air" has mass. Demonstration: Teacher will weigh an "empty" balloon on a balance. Then, teacher will blow up the balloon and weigh the balloon again. Discussion Questions: What did you observe? Does "air" have mass? Why? What is in the air? What is oxygen or carbon dioxide? What do gases have to do with

matter? What are the three states of matter? What happens to water when you boil it? Do the water molecules disappear or just change into a different form?

Notes/Discussion– students will take notes on the composition of Earth's ancient atmosphere and how it has changed since then. Students will complete a review worksheet on the material learned thus far. (most likely homework) *Guided Notes&PowerPoints for students as needed* *Peer review of homework, answer sheet provided for student support as needed*

Demonstration/Discussion/Notes – students will represent air molecules, there will be two different sized boxes on the ground. Students will stand in different boxes and be asked different questions to determine mass/density of the boxes based on the number of students in the box. Discussion Questions: What is mass? What is volume? What is density? What do the students represent? Which box has more mass? More density? How do you know? How can we increase the mass? How can we increase the density? Is the volume the same for each box? What does the volume have to do with density? What makes something more or less dense?

Writing Assessment – students will write two paragraphs about the atmosphere using the notes and information they have learned so far. The paragraphs will include information on how the atmosphere has changed, how it is important and how it is structured based on density and pressure. (most likely homework assignment) *Students with IEPs will have a guideline to follow and fill out as they write

Ozone Lab – Students will collect data around the school related to ground-level ozone. Students will create Schonbein slips using potassium iodine and detect traces of ground-level ozone at marked locations within the school. This is a multiple-day lab where students can collect data and relate the production of ozone to concepts such as pollution, climate change, and human impact on the Earth.

Layers of the Atmosphere →Notes/Discussion– students will take notes on the layers of the atmosphere and the characteristics of each. Students will practice learning the names of the layers in the correct order from bottom to top with their table. (each table will be challenged to first write the five layers down correctly, and then put them in order. They will repeat this multiple times) *Guided Notes &PowerPoints for students as needed*

Review/Self Assessment – students will complete a review activity with their table, matching the description cards with the layer cards. This will be used a few different days as an intro to class. Students will use it to see how well they know the material and help them prepare for their quiz

Layers of the Atmosphere Foldable – Students will create a foldable on the layers of the atmosphere to use as a visual representation and a study guide. It will include a diagram of the layers along with information on each layer. *visual aid for studying/learning*

Stations Activity – Students will rotate through 4 stations reviewing the atmosphere characteristics and layers. Station 1: Quizizz, Station 2: Quizlet Station 3: Tic Tac Toe Station 4: Heads Up Game Students will record their work at each station in a packet that will be checked for completion.

Scaling the Atmosphere – Students will scale the layers of the atmosphere to the hallway and/or any athletic field on school property.

Air Pollution →Air Pollution IQ Pre-Test & Introduction– Without any prior discussion on air pollution, students will take a quiz to assess their knowledge of the subject. They will share their answers with their table and then correct answers will be discussed with the class.

Air Pollution Activity – Students will be given cards with different pollution-related items on them. They will then walk around the room and tape them to the appropriate board. Each board will have a different heading (i.e. sources, pollutants, causes, solutions, etc.) and students will try their best to match their cards to the correct heading. Each board will be discussed along with the correct answers.

Air Pollution Discussion & Notes – Students will continue discussing air pollution and take notes on different types of pollutants and their effects on the Earth.

Wind Turbine Design Challenge – Students will be given a set of common materials (paper plates, index cards, PVC pipe, wooden dowels, popsicle sticks, toothpicks foam, corks, pipe cleaners, etc.) They will work in groups to design the wind turbine that lifts the most weight. They will have 3-4 days to design, build, test, redesign & rebuild as much as needed. On the last day they will test their designs using a fan. A string will be attached to their turbines, with a paper cup attached and weight will be added to the cup as needed. A discussion will be held about which design worked best and why. The winning group will explain their design process and why they think their design lifted the most weight.

Weather & Climate →Weather versus Climate – Students will work with their table to come up with a definition for weather and for climate. They will write their definitions on a whiteboard for the table. Definitions will be shared with the class and the best definition will be determined. Once students write down the correct definitions in their notes they will practice this concept. Ten statements will be posted on the smart-board and students will record whether the statement describes weather or climate. Answers will be shared and gone over. Discussion Questions: What is weather? What is climate? How are they different? How are they the same? How do we measure each one? Why are they important to measure and study?

Notes/Discussion – Students will take notes on the cause of weather, weather versus climate, and all of the factors that are studied to determine weather. *Guided notes & power-points as needed*

Demonstration– Teacher will demonstrate how air moves and creates wind. A candle will be placed in a convection box and lit. Then rolled up paper will be lit on fire and then blown out, and held over one of the openings in the convection box. The smoke from the burnt paper will travel into the box and out the other opening. Discussion Questions: What do you observe? Why is this happening? What is the candle doing to the air inside the box? Why is the smoke from the paper flowing into the box? Where is the air temperature hotter? Colder? Why does the smoke rise out of the second tube? Think about density, how does that relate to "sinking" and "floating"?

Notes/Discussion – Students will take notes on air masses and fronts. Students will view several video clips on the different types of fronts. Students will view maps on the board and determine what type of air mass forms in different locations. Students will discuss the relationship between air masses and fronts. Students will fill in a chart describing the different types of fonts and then draw pictures/symbols to go along with each type. *Guided Notes & power-points for students as needed*

Foldable Activity – Students will construct a foldable to review the types of fronts. Student will then use the foldable to complete a review worksheet. *outline to fill in on foldable for students with IEPs*

Heating the Globe – Students will tape thermometers to a larger inflatable globe and heat (using lamps) the globe much like the Sun heats the Earth. Students can observe temperatures and relate the heating patterns on the globe to that of the Earth. Climate zones can be established, as well.

Relative Humidity Lab – Students, using psychrometers can collect relative humidity data around the school at various locations. Students can then do this collection over multiple days to create a time series of data. Students then can graph data and interpret trends/relationships.

Rain Gauge – Students will place a rain gauge in a controlled location around the school grounds. Students can collect data of daily rain fall and plot results. Students can then interpret rain totals and relate the cause of the rain to weather patterns (www.rap.ucar.edu/weather/model or earth.nullschool.net)

Student Meteorologist Project– Students will create their own weather maps and interpret weather patterns. Students will need to create a 5-day weather forecast and properly interpret weather symbols on their maps, as well as use commonly-used weather vocabulary such as: fronts, air masses, pressure, uplift, downdrafts, storm cells, jet stream, polar, climate zone, etc.

Evidence/Performance Tasks

Science courses are designed to promote skill attainment. Student progression and pace through which they proceed through the performance tasks is based on their affinity for and ability to reach skill attainment. The teacher will determine formative and summative skill attainment; alternative assessments will be incorporated for each student based on their strengths and challenges.

Formative Assessments:

- Worksheets
- Do Nows
- Exit Tickets
- Class Discussions

Quizzes:

- Layers of the Atmosphere Quiz
- Weather Masses and Fronts Quiz

Bench Marks:

Formal Lab Reports

- Air Pollution Lab

Alternative:

- Atmosphere Prior Knowledge Chart
- Air Pollution Webquest
- Atmosphere Foldable
- Atmosphere Study Guide
- Weather Study Guide
- Atmosphere Stations Review
- Weather Stations Review
- Weather Instrument Activity

Summative:

Unit Tests:

- Weather Test
- Atmosphere Test

Materials

McGraw-Hill Earth Science iScience Textbooks (ISBN#: 978-0-07-888003-2)

Guided note packets (teacher developed)

Technology (student & teacher laptops, iPads, SmartBoard, document camera)

Thermometer

Balances

Meter sticks

Flasks, graduated cylinders, & beakers

Calculators

Lab bins/trays

Rulers

Art supplies

Graph paper

Lab goggles

Dry-erase markers

Globe

Rain gauge

Digital Weather station

NOAA archived data

PVC pipe

Paper plates

Matches

Candles

Toothpicks

Balloons

Test tubes

- - Gauze .