NGSS OVERVIEW

WEATHER AND CLIMATE

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

Performance Expectation 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.

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

Performance Expectation MS-ETS1-3: Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Performance Expectation MS-ETS1-4: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Activity Description	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts	Common Core State Standards
1. **Talking It Over: Climate Change** In this activity, students are introduced to various scenarios that illustrate different aspects of climate change. The scenarios are used to develop student interest in the topic, uncover background knowledge and potential misconceptions, and set a stage for students to ask questions related to climate change— questions that they will answer during the course of the unit.	MS-ESS3.C MS-ESS3.D	Asking Questions and Defining Problems Connections to Nature of Science: Scientific Knowledge Is Based on Empirical Evidence	Stability and Change Connections to Nature of Science: Science Knowledge Assumes an Order and Consistency in Natural Systems	ELA/Literacy: SL.8.1
2. **Investigation: Investigating Local Weather** Students first collect 5 days of weather data. They use mathematics as they compute three kinds of averages to represent the data. Students then analyze seasonal weather data, comparing them to the daily averages previously calculated and looking for patterns in the data. They learn that daily weather data are more accurate for providing data about a particular day, but monthly and seasonal data are more accurate to use when comparing weather patterns.	MS-ESS2.C MS-ESS2.D	Planning and Carrying Out Investigations Analyzing and Interpreting Data	Cause and Effect Patterns Connections to Nature of Science: Science Knowledge Assumes an Order and Consistency in Natural Systems	Mathematics: MP.2 ELA/Literacy: SL.8.1
3. **Project: Local History of Severe Weather** Students design and conduct a survey to collect data about the history of severe weather events in the local area. They then collate, analyze, and graph the survey responses. Finally, they review data for evidence for recent changes in the frequency and/or intensity of severe weather. The next activity extends the concept of weather to climate and the patterns of Earth's climate zones.	MS-ESS2.C MS-ESS2.D	Planning and Carrying Out Investigations Analyzing and Interpreting Data Asking Questions and Defining Problems	Cause and Effect Patterns	ELA/Literacy: WHST.6-8.7

WEATHER AND CLIMATE (continued)

Activity Description	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts	Common Core State Standards
4. **Problem Solving: Climate Types and Distribution Patterns** Students extend their understanding of local weather by learning about regional climate. They use descriptions and maps of the major climate zones of North America and the world to find patterns in the distribution of climates that relate to an area's latitude, proximity to an ocean, and altitude. They also examine data indicating that the locations of climate zones have changed over time.	MS-ESS2.D MS-LS4.C	Analyzing and Interpreting Data Engaging in Argument from Evidence Connections to Nature of Science: Scientific Knowledge Is Based on Empirical Evidence	Systems and System Models Patterns Cause and Effect	Mathematics: MP.2 ELA/Literacy: SL.8.1 RST.6-8.7
5. **Problem Solving: Earth's Surface** Students develop and use a strategy for estimating the percent of Earth's surface covered by water. Students are also asked to consider whether, and how, the oceans might influence weather and climate. The next activity develops this idea further by comparing how water and land each respond to heat.	MS-ESS2.D	Using Mathematics and Computational Thinking Planning and Carrying Out Investigations Analyzing and Interpreting Data	Patterns	Mathematics: MP.2
6. **Laboratory: Heating Earth's Surfaces** In the previous activity, students learned that most of Earth's surface is covered by water. In this activity, they plan and carry out an investigation that shows how water responds to thermal energy in a different manner than land. They discover that water is slow to heat and cool. They are led to the conclusion that water has a strong ability to store thermal energy. Students are beginning to build an understanding that the oceans exert a major influence on weather and climate by absorbing energy from the Sun and releasing it over time. The next two activities develop this idea by revealing more about the behavior of water, including how ocean currents redistribute the energy of the Sun around the globe.	MS-ESS2.D	Planning and Carrying Out Investigations Analyzing and Interpreting Data Constructing Explanations and Designing Solutions Developing and Using Models	Systems and System Models Cause and Effect Patterns	ELA/Literacy: RST.6-8.3

WEATHER AND CLIMATE (continued)

Activity Description	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts	Common Core State Standards
7. **Problem Solving: Ocean Temperatures** Students create models to represent the variation of ocean temperatures around the world. In the previous activity, they learned that water stores thermal energy better than land. Here they detect the pattern of decreasing water temperature with increasing latitude, although they also see regional variations in this pattern. Over the next three activities, they will apply this knowledge as they learn the causes of the complex system of oceanic circulation and its effect on climate.	MS-ESS2.C MS-ESS2.D	Developing and Using Models Planning and Carrying Out Investigations Analyzing and Interpreting Data Constructing Explanations and Designing Solutions	Systems and System Models Cause and Effect Patterns Connections to Nature of Science: Science Knowledge Assumes an Order and Consistency in Natural Systems	Mathematics: MP.2 ELA/Literacy: RST.6-8.3 SL.8.1 SL.8.4
8. **Modeling: Investigating Water** Students model the movement of water in the ocean by carrying out a series of simple investigations using water and ice in cups. They interpret the patterns shown by their data to conclude that temperature and salinity affect whether water rises or sinks and that this is due to differences in density. Students are guided to consider the implications of this behavior in the ocean, especially in polar regions where sea ice forms or melts. The concept of global patterns of interconnected ocean currents is introduced in the next activity.	MS-ESS2.C MS-PS3.B	Developing and Using Models Planning and Carrying Out Investigations Analyzing and Interpreting Data Constructing Explanations and Designing Solutions	Systems and System Models Cause and Effect Patterns	ELA/Literacy: RST.6-8.3
9. **Role Play: Oceans and Climate** Students use what they have learned about how water temperature and salinity affect water density to understand the mechanisms by which ocean currents transfer energy and thus affect climates.	MS-ESS2.C MS-ESS2.D	Planning and Carrying Out Investigations Engaging in Argument from Evidence Constructing Explanations and Designing Solutions Connections to Nature of Science: Scientific Knowledge Is Based on Empirical Evidence	Energy and Matter Cause and Effect Patterns Connections to Engineering, Technology and Applications of Science: Interdependence of Science, Engineering, and Technology Connections to Engineering, Technology, and Applications of Science: Influence of Science, Engineering, and Technology on Society and the Natural World	ELA/Literacy: RST.6-8.9 SL.8.1

WEATHER AND CLIMATE (continued)

Activity Description	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts	Common Core State Standards
10. **Reading: The Causes of Climate** The role of the oceans in climate is further developed as students use maps as models to explain the causes of the global pattern of interconnected ocean currents. Students also learn that both local and regional geography influence climate.	MS-ESS2.C MS-ESS2.D MS-ESS3.D	Constructing Explanations and Designing Solutions	Energy and Matter Cause and Effect Systems and System Models Patterns	ELA/Literacy: RST.6-8.9
11. **Investigation: Worldwide Wind** Students are introduced to the concept of wind as they begin to learn about the role of the atmosphere on weather and climate. Students collect data to identify the most common wind direction in a particular location. They share their data with the class and first identify regional patterns before constructing a map of global wind patterns. In the next activity, students learn how to measure wind speed and direction.	MS-ESS2.C MS-ESS2.D	Planning and Carrying Out Investigations Analyzing and Interpreting Data Connections to Nature of Science: Scientific Knowledge Is Based on Empirical Evidence	Systems and System Models Patterns Connections to Nature of Science: Science Knowledge Assumes an Order and Consistency in Natural Systems	ELA/Literacy: RST.6-8.3
12. **Design: Measuring Wind Speed and Direction** Students use an engineering design process to design, build, and iteratively test wind- measurement instruments to collect wind data. They use the data collected from their optimized instruments as evidence for how winds moving around landforms affect weather patterns. The next activity extends their understanding of prevailing winds (introduced in the previous activity) as they examine a series of weather maps and observe how weather conditions often travel in the direction of the prevailing winds. This activity provides an opportunity to assess Performance Expectations MS-ETS1-3 and MS-ETS1-4.	MS-ETS1.B MS-ETS1.C MS-ESS2.C MS-ESS2.D	Developing and Using Models Planning and Carrying Out Investigations Constructing Explanations and Designing Solutions Using Math-ematics and Computational Thinking Engaging in Argument from Evidence	Structure and Function Connections to Engineering, Technology and Applications of Science: Influence of Science, Engineering, and Technology on Society and the Natural World	ELA/Literacy: RST.6-8.3 SL.8.1 SL.8.4

WEATHER AND CLIMATE (continued)

Activity Description	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts	Common Core State Standards
13. **Investigation: Forecasting Weather** Pairs of students work together to interpret a weather map of the United States for a specific day, construct a weather report, and then present their report to the class. Students use the information from all the reports and their understanding of prevailing winds to forecast the "next day's" weather. This activity provides an opportunity to assess Performance Expectation MS-ESS2-5.	MS-ESS2.C MS-ESS2.D	Planning and Carrying Out Investigations Analyzing and Interpreting Data Engaging in Argument from Evidence Developing and Using Models	Cause and Effect Systems and System Models Connections to Nature of Science: Science Knowledge Assumes an Order and Consistency in Natural Systems	ELA/Literacy: SL.8.1 SL.8.4
14. **Reading: Atmosphere and Climate** Students read about the relationships among Earth's atmosphere, its circulation patterns, weather, and climate. The Reading helps students make sense of the climate-related concepts they have studied in previous activities. This activity provides an opportunity to assess Performance Expectation MS-ESS2-6. In addition, the reading introduces the greenhouse effect and how changes in the amounts of atmospheric greenhouse gases can impact climate change. This is the focus of the remaining activities in the unit.	MS-ESS2.C MS-ESS2.D MS-ESS3.D	Developing and Using Models Obtaining, Evaluating, and Communicating Information	Stability and Change Energy and Matter Systems and System Models	ELA/Literacy: RST.6-8.7
15. **Investigation: History of Earth's Atmosphere** In the previous activity, students learned about some of the characteristics of Earth's atmosphere. In this activity, they analyze and interpret data related to changes in Earth's atmosphere over time. They see that Earth's atmosphere has changed dramatically over geologic time. They also learn how human activity is causing small but significant changes to the level of carbon dioxide in the modern atmosphere, a concept first introduced in the previous activity. In the next activity, students will investigate the link between human-caused increases in atmospheric carbon dioxide and global warming.	MS-ESS3.D	Planning and Carrying Out Investigations Analyzing and Interpreting Data Engaging in Argument from Evidence	Scale, Proportion, and Quantity Stability and Change	ELA/Literacy: SL.8.1

WEATHER AND CLIMATE (continued)

Activity Description	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts	Common Core State Standards
16. **Investigation: Global Warming** Throughout this unit, students have investigated the major factors that influence Earth's climate. In this activity, students look at historical data spanning the past 100 years to try to understand the causes of current global warming. They ask questions related to the data to figure out what the evidence indicates and to better understand how human activities relate to global warming. This activity provides an opportunity to assess Performance Expectation MS-ESS3-5.	MS-ESS3.D	Asking Questions and Defining Problems Analyzing and Interpreting Data Using Mathematics and Computational Thinking Engaging in Argument from Evidence Connections to Nature of Science: Scientific Knowledge Is Based on Empirical Evidence	Stability and Change Cause and Effect Patterns Systems and System Models Connections to Nature of Science: Science Addresses Questions about the Natural and Material World	Mathematics: MP.4 ELA/Literacy: WHST.6-8.1 SL.8.1
17. **Talking It Over: People, Weather, and Climate** In this culminating activity, students analyze data for a fictional city. The data relate to local atmospheric, water, weather, and climate conditions. Students have an opportunity to apply their understanding of these topics as they attempt to determine whether humans are affecting local conditions and what can be done to mitigate any such impact.	MS-ESS3.D MS-ESS3.C MS-ESS3.A	Analyzing and Interpreting Data Using Mathematics and Computational Thinking Engaging in Argument from Evidence Obtaining, Evaluating, and Communicating Information	Patterns Cause and Effect Stability and Change Connections to Engineering, Technology, and Applications of Science: Influence of Science, Engineering, and Technology on Society and the Natural World	ELA/Literacy: RST.6-8.7 SL.8.1 WHST.6-8.1

NGSS CORRELATIONS

WEATHER AND CLIMATE

Crosscutting Concepts		Activity number
Cause and Effect	Cause and effect relationships may be used to predict phenomena in natural or designed systems.	2, 4, 6, 7, 8, 9, 10, 13, 16
	Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.	2, 3, 9, 10, 13, 17
	Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.	16, 17
Energy and Matter	Within a natural system, the transfer of energy drives the motion and/or cycling of matter.	9, 10, 14
Patterns	Patterns can be used to identify cause and effect relationships.	4, 7, 8, 9, 11, 16, 17
	Graphs, charts, and images can be used to identify patterns in data.	2, 3, 4, 5, 6, 7, 10, 11, 16, 17
	Patterns in rates of change and other numerical relationships can provide information about natural and human designed systems.	3, 9, 16, 17
Stability and Change	Small changes in one part of a system might cause large changes in another part.	14, 16
	Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales, including the atomic scale.	14, 15
	Stability might be disturbed either by sudden events or gradual changes that accumulate over time.	1, 14, 15, 16, 17
Structure and Function	Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.	12
Systems and System Models	Systems may interact with other systems and be a part of larger complex systems.	7, 8, 10, 13, 16
	Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems.	4, 6, 7, 8, 11, 13, 14
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.	15

Crosscutting Concepts		Activity number
Connections to Engineering, Technology, and Applications of Science	Engineering advances have led to important discoveries in virtually every field of science, and scientific discoveries have led to the development of entire industries and engineered systems	9
	Technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations.	9, 12
	All human activity draws on natural resources and has both short- and long-term consequences, positive as well as negative, for the health of people and the natural environment.	17
Connections to the Nature of Science	Science assumes that objects and events in natural systems occur in consistent patterns and are understandable through measurement and observation.	1, 2, 7, 11, 13
	Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes.	16
Science and Engineering Practices		**Activity number**
Analyzing and Interpreting Data	Analyze and interpret data to determine similarities and differences in findings.	2, 3, 4, 5, 6, 7, 11
	Construct and interpret graphical displays of data to identify linear and nonlinear relationships.	2, 3, 4, 6
	Analyze and interpret data to provide evidence for phenomena.	3, 6, 8, 11, 13, 15, 17
	Analyze displays of data to identify linear and nonlinear relationships.	16
Asking Questions and Defining Problems	Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles.	3
	Ask questions to identify and clarify evidence of an argument.	1, 16
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 nature operate today as they did in the past and will continue to do so in the future.	6, 7, 8
	Construct an explanation that includes qualitative or quantitative relationships between variables that predict or describe phenomena.	6, 8, 9, 10
	Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process or system.	12

Science and Engineering Practices		Activity number
Developing and Using Models	Develop a model to predict and/or describe phenomena.	6, 7, 8, 14
	Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs.	12
	Evaluate limitations of a model for a proposed object or tool.	12
	Use and/or develop a model of simple systems with uncertain and less predictable factors.	13
Engaging in Argument from Evidence	Construct and present oral and written arguments 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.	4, 16
	Use an oral and written argument supported by evidence to support or refute an explanation or a model for a phenomenon.	13, 17
	Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.	12
	Compare and critique two arguments on the same topic and analyze whether they emphasize similar or different evidence and/or interpretations of facts.	9
	Respectfully provide and receive critiques about one's explanations, procedures, models, and questions by citing relevant evidence and posing and responding to questions that elicit pertinent elaboration and detail.	15
	Make an oral or written argument that supports or refutes the advertised performance of a device, process, or system based on empirical evidence concerning whether or not the technology meets relevant criteria and constraints.	12
Obtaining, Evaluating, and Communicating Information	Integrate qualitative scientific and technical information in written text with that contained in media and visual displays to clarify claims and findings.	14
	Evaluate data, hypotheses, and/or conclusions in scientific and technical texts in light of competing information or accounts.	17

Science and Engineering Practices		Activity number
Planning and Carrying Out Investigations	Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.	6
	Conduct an investigation to produce data to serve as the basis for evidence that meet the goals of an investigation.	6, 8
	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.	2, 3, 5, 6, 7, 8, 11, 12, 13, 15
	Evaluate the accuracy of various methods for collecting data.	5, 9
Using Mathematics and Computational Thinking	Use mathematical representations to describe and/or support scientific conclusions and design solutions.	5, 16, 17
	Create algorithms (a series of ordered steps) to solve a problem.	5
	Use digital tools and/or mathematical concepts and arguments to test and compare proposed solutions to an engineering design problem.	12
Constructing Explanations and Designing Solutions	Apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system	12
	Optimize performance of a design by prioritizing criteria, making trade-offs, testing, revising, and retesting.	12
Analyzing and Interpreting Data	Distinguish between causal and correlational relationships in data	16
	Apply concepts of statistics and probability (including mean, median, mode, and variability) to analyze and characterize data, using digital tools when feasible.	2, 5
Connections to the Nature of Science	Scientific knowledge is based on logical and conceptual connections between evidence and explanations.	1, 4, 9, 11, 16
	Science findings are frequently revised and/or reinterpreted based on new evidence	9

Disciplinary Core Ideas		Activity number
Developing Possible Solutions (ETS1.B)	A solution needs to be tested, and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem.	12
	There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.	12
	Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.	12
	Models of all kinds are important for testing solutions.	
Optimizing the Design Solution (ETS1.C)	Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of the characteristics may be incorporated into the new design.	12
	The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.	12
The Roles of Water in Earth's Surface Processes (ESS2.C)	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.	2, 3, 7, 9, 10, 11, 12, 13, 14
	Global movements of water and its changes in form are propelled by sunlight and gravity.	9, 10, 14
	Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents.	8, 9, 10, 14
Weather and Climate (ESS2.D)	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.	2, 3, 4, 5, 6, 7, 9, 10, 11, 13, 14
	Because these patterns are so complex, weather can only be predicted probabilistically.	2, 3, 10, 11, 12, 13
	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.	5, 6, 9, 10, 14

Disciplinary Core Ideas		Activity number
Natural Resources (ESS3.A)	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.	17
Human Impacts on Earth Systems (ESS3.C)	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.	1
	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.	17
Global Climate Change (ESS3.D)	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.	1, 10, 14, 15, 16, 17
Adaptation (LS4.C)	Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes.	1, 4
Conservation of Energy and Energy Transfer (PS3.B)	Energy is spontaneously transferred out of hotter regions or objects and into colder ones.	8

Performance Expectations		Activity number
Earth's Systems (ESS2)	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. (MS-ESS2-5)	13
	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-ESS2-6)	14
	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. (MS-ESS3-5)	16
Engineering Design (ETS1)	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. (MS-ETS1-3)	12
	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. (MS-ETS1-4)	12

COMMON CORE STATE STANDARDS: CONNECTIONS AND CORRELATIONS

WEATHER AND CLIMATE

Making Connections in ELA

As with all SEPUP instructional materials, this unit introduces multiple opportunities for students to engage in a range of ELA practices and skills that are important grade-specific goals of the common core state standards and are also essential to the sensemaking students are doing throughout the unit. Throughout the unit, students engage in discussions both with their peers in groups, and as a class. Specifically, in activity 1, students look at a variety of scenarios to determine if the climate is changing. They engage in discussions with one another about these scenarios using SEPUP's 4-2-1 model for collaborative work (SL.8.1). Students design and conduct surveys in activity 3 to help them understand severe weather events where they live. They use information obtained from teachers' visual displays that show important weather events in the US to inform their project (WHST.6-8.7). In activity 4, students organize information about climates by looking at climate graphs from different regions, and descriptions of these climates. Next, they use this information to determine the climate of three specific regions. Students then organize this information on a chart (RST.6-8.7). Later in the unit, in activity 7, students carefully map ocean surface temperatures at various regions on the globe. Upon completion of this activity, students engage in a jigsaw activity where they discuss findings at these different regions (RST.6-8.3; SL.8.4). In activity 10, students continue to consider how the oceans affect climate by using various sources such as readings, maps, and teacher-led models to develop their understanding (RST.6-8.9). Towards the end of the unit, in activity 16, students examine historical data related to the cause of climate change, with a focus on human activity. They use this information to develop an argument that either supports or refutes a friend's claim related to humans' ability to prevent climate change (WHST.6-8.1). In addition, Appendix E: Literacy Strategies in the Student Book contains optional resources to support reading, writing and oral communication.

Common Core State Standards – English Language Arts		Activity number
Reading in Science and Technical Subjects (RST)	Follow precisely a multi-step procedure when carrying out experiments, taking measurements, or performing technical tasks. (RST.6-8.3)	6, 7, 8, 11, 12
	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (RST.6-8.7)	4, 14, 17
	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (RST.6-8.9)	9, 10
Speaking and Listening (SL)	Engage effectively in a range of collaborative discussions (e.g., one-on-one, in groups, teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly. (SL.8.1)	1, 2, 4, 7, 9, 12, 13, 15, 16, 17
	Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound and valid reasoning, and well-chosen details: use appropriate eye contact, adequate volume, and clear pronunciation. (SL.8.4)	7, 12, 13

Common Core State Standards – English Language Arts		Activity number
Writing in History/ Social Studies, Science, and Technological Subjects (WHST)	Write arguments focused on discipline-specific content. (WHST.6-8.1)	16, 17
	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (WHST.6-8.7)	3

Making Connections in Mathematics

This unit introduces multiple opportunities for students to engage in math practices and skills that are important grade-specific goals of the common core state standards and are also essential to the sensemaking students are doing throughout the unit. For example, in activity 2, students look at weather data, calculate three different kinds of averages (mean, median, and mode), and discuss the usefulness of these calculations. Students also determine seasonal data by calculating monthly weather averages. During this exercise, the students also convert English units to metric units (MP.2). In activity 4, the students calculate average temperature and total precipitation for seasons in a specific location (MP.2). In activity 16, students examine graphs representing Earth's surface temperature over time. They also use an online interactive that allows them to visualize datasets related to changes in carbon dioxide in the atmosphere, and changes in human activities over the same time period. Students use these mathematical representations to consider the link between human activity and climate change (MP.4).

Common Core State Standards – Mathematics		Activity number
Mathematical Practice (MP)	Reason abstractly and quantitatively. (MP.2)	2, 4, 5
	Model with mathematics. (MP.4)	16