

## UNIT OVERVIEW

### WEATHER AND CLIMATE

**Unit Issue:** How human behavior is affecting weather and climate and what can be done about it.

**Anchoring Phenomenon:** Weather and climate change over time and vary from place to place due to natural processes and human activity.

Listed below is a summary of the activities in this unit. Note that the total teaching time is listed as 24–32+ periods of approximately 45–50 minutes (approximately 5–7 weeks). If you don't have enough time to complete the whole unit, consider skipping Activities 5 and 12.

| Activity Description  | Topics   | Advance Preparation   | Assessment | Teaching Periods |
|---|--|---|------------|------------------|
| <p><b>1. Talking It Over: Climate Change</b><br/>Students examine various events linked to climate change. They develop questions about climate change to guide their learning through the unit. Later in the unit, they use evidence in explaining how each event is related to climate change.</p>  | <p>climate change<br/><br/>LITERACY<br/>SENSEMAKING</p>  |   |            | 1                |
| <p><b>2. Investigation: Investigating Local Weather</b><br/>Students use a weather website (or other published resource) to obtain weather data for their local area. They record several key weather observations from 5 consecutive days; find the mean, median, and mode values for each of their data sets, and discuss the benefits and drawbacks of using each of the three types of averages. They then obtain local monthly weather averages and use these to compute seasonal data. They graph the seasonal data and then compare their 5-day averages to monthly and seasonal data.</p> | <p>weather, daily vs. monthly vs. seasonal data (mean, median, mode), precipitation, meteorologist<br/><br/>LITERACY<br/>MATHEMATICS</p> | <p>Arrange Internet access; gather metric rulers, weather reports for 5 consecutive days (optional); copy Student Sheets.</p> | ODA PROC.  | 1–2              |
| <p><b>3. Project: Local History of Severe Weather</b><br/>Students design and conduct a survey to learn about the history of weather disasters in the local area. They consider whether there is evidence that the incidence of severe weather has changed over time.</p>   | <p>severe weather, atmosphere, atmospheric scientist<br/><br/>LITERACY</p>   | <p>Copy Student Sheets.</p>   | ODA A2     | 2+               |

## WEATHER AND CLIMATE (continued)

| Activity Description   | Topics   | Advance Preparation   | Assessment | Teaching Periods |
|--|--|---|------------|------------------|
| <p><b>4. Problem Solving: Climate Types and Distribution Patterns</b><br/>                     Students use a literacy strategy known as a DART (directed activity related to text) to organize the information about different climates (dry, tropical, etc.). They identify their local climate and compare their personal observations and seasonal weather averages to the climate description. Students then examine climate graphs for three different regions and use the graphs to identify each region’s climate. The class discusses the relationship between climate and weather.</p> | weather, climate zones, climatologist, latitude<br><br>LITERACY<br>MATHEMATICS | Copy Student Sheet.   | ARG A5     | 2+               |
| <p><b>5. Problem Solving: Earth’s Surface</b><br/>                     Students use a gridded world map to estimate the amounts of Earth’s surface covered by water and land. They then label major landmasses and bodies of water for use later in the unit. As a class, they calculate the mean, median, and mode of their estimates to help determine an “accepted value” for the class.</p>  | hydrologist, mean, median, mode<br><br>MATHEMATICS                             | Gather calculators (optional), copy Student Sheets.   |            | 1                |
| <p><b>6. Laboratory: Heating Earth’s Surfaces</b><br/>                     Students plan and carry out an experiment to measure how the Sun’s energy heats land and water as well as how quickly both of those substances cool. An Anticipation Guide elicits students’ current ideas about the warmth of land and water and reinforces the idea that differences in heating and cooling of land and water are important factors in determining climate.</p>   | climate, Sun’s energy<br><br>LITERACY<br>SENSEMAKING                           | Place sand and water out in large basins; gather light sources/heat lamps (optional), graph paper; copy Student Sheets. | PCI PROC.  | 2–3              |
| <p><b>7. Problem Solving: Ocean Temperatures</b><br/>                     Students investigate the range of mean ocean surface temperatures around the globe. They map and discuss patterns of surface temperatures in particular regions of the oceans. Members of each small group then merge their findings and summarize global patterns.</p>  | climate, ocean temperatures, latitude  | Obtain calculators; copy Student Sheets.  | EXP A4     | 1–2              |

## WEATHER AND CLIMATE (continued)

| Activity Description   | Topics   | Advance Preparation   | Assessment  | Teaching Periods |
|--|--|---|---|------------------|
| <p><b>8. Modeling: Investigating Water</b><br/>Students investigate the mixing of cold water with warm water, and fresh water with salt water. They learn that the denser water (cold and/or salty) sinks below the less dense water (warm and/or fresh). They relate their classroom observations to the movement of water of different temperatures and salinity in the ocean.</p>   | <p>density, scientific model</p> <p>LITERACY</p>                                       | <p>Prepare blue-colored ice cubes; practice the demonstration; provide hot and cold water.</p>  | <p>EXP A6</p>   | <p>1–2</p>       |
| <p><b>9. Role Play: Oceans and Climate</b><br/>Students learn more about how oceans affect climate. They participate in a role play in which the characters discuss the history of the identification of the Gulf Stream and how modern technology is used to gather ocean data. An Intra-Act literacy strategy helps guide discussion about the ideas presented in the role play.</p> | <p>climate, ocean currents, climatologist, hydrologist</p> <p>LITERACY</p>             | <p>Copy Student Sheets, obtain role play props (optional).</p>  | <p>EXP A5</p>   | <p>1–2</p>       |
| <p><b>10. Reading: The Causes of Climate</b><br/>Students read about more factors affecting climate, including the Sun’s energy. A literacy strategy helps students comprehend the ideas presented in the text.</p>  | <p>climate, Sun’s energy, landforms, altitude, Coriolis effect</p> <p>LITERACY</p>     | <p>Obtain heat lamp (optional).</p>   | <p>MOD A5</p>   | <p>1</p>         |
| <p><b>11. Investigation: Worldwide Wind</b><br/>Students use a computer simulation to identify the most common wind direction in a particular location. They share their data with the class and construct a map of global wind patterns.</p>  | <p>wind, wind direction, prevailing wind</p>   | <p>Obtain scale; arrange Internet access; copy Student Sheets.</p>  | <p>ODA A2</p>   | <p>1–2</p>       |
| <p><b>12. Design: Measuring Wind Speed and Direction</b><br/>Students are introduced to the Beaufort wind force scale and its development. They use the engineering design process as they design, build, and test instruments for measuring wind speed and direction. After improving their instruments, they use them to collect wind data.</p>                                      | <p>wind, anemometer, wind vane, engineering design</p>                                 | <p>Gather two large fans, chart paper (optional), timers, scissors, staplers, glue, markers, tape, additional building materials (optional); copy Student Sheets.</p> | <p>PCI PROC.<br/>ENG PROC.<br/>(Assessment of PEs MS-ETS1-3, MS-ETS1-4)</p> | <p>3+</p>        |
| <p><b>13. Investigation: Forecasting Weather</b><br/>Students work together to interpret a weather map and construct a weather report. Each group then presents a weather report to the class. Students use this information to forecast the next day’s weather.</p>   | <p>weather maps, weather fronts, weather forecasts, high- and low-pressure systems</p> | <p>Gather local weather maps; copy Student Sheets.</p>  | <p>ARG PROC.<br/>(Assessment of PE MS-ESS2-5)</p>                           | <p>1–2</p>       |

**WEATHER AND CLIMATE** (continued)

| Activity Description   | Topics  | Advance Preparation                                 | Assessment  | Teaching Periods |
|--|---|---|---|------------------|
| <p>14. <b>Reading: Atmosphere and Climate</b><br/>Students read about the relationships among Earth’s atmosphere, its circulation patterns, weather, and climate. A literacy strategy helps them comprehend the ideas presented in the text.</p>   | <p>atmosphere, atmospheric layers, wind, global warming, greenhouse gases<br/><br/>LITERACY</p>             |   | <p>MOD A4<br/>(Assessment of PE MS-ESS2-6)</p>                | <p>1</p>         |
| <p>15. <b>Investigation: History of Earth’s Atmosphere</b><br/>Students place in chronological order eight cards describing the history of Earth’s atmosphere. With these cards they examine the relative amounts of carbon dioxide and oxygen gases at different times in Earth’s history, and the role of living organisms in determining the composition of the atmosphere.</p>   | <p>atmospheric composition, geological time</p>   |   |   | <p>1</p>         |
| <p>16. <b>Investigation: Global Warming</b><br/>Students analyze graphs of historical data related to global warming and climate change, examining the influence of both natural and human-related factors.</p>  | <p>causal relationship, correlation, global warming, greenhouse gases, climate change<br/><br/>LITERACY</p> | <p>Arrange Internet access; copy Student Sheet.</p> | <p>ARG A2<br/>(Assessment of PE MS-ESS3-5)<br/>E&amp;T:A5</p> | <p>2</p>         |
| <p>17. <b>Talking It Over: People, Weather, and Climate</b><br/>Students role play atmospheric scientists, climatologists, hydrologists, and meteorologists who analyze data summarizing weather, climate, water usage, and atmospheric conditions for the fictional Sunbeam City. Students consider the possible link between population growth and changes in local weather, atmosphere, and water availability. They then make recommendations about ways to reduce humans’ impact on local conditions.</p> | <p>weather, climate, atmosphere, hydrologist, weather careers<br/><br/>LITERACY<br/>SENSEMAKING</p>         | <p>Obtain calculators; copy Student Sheets.</p>     | <p>E&amp;T A3</p>   | <p>2–3</p>       |