



Grade 6 Science - Unit 2 - Weather and Climate

Unit Focus

In this unit, students will learn how weather forms as a result of the complex interactions between temperature, humidity, and air pressure. Through the study and creation of forecasts they will understand how other conditions play a role in weather. Additionally, students will learn how tools and technology are used to create forecasts and how these forecasts can be used both locally and globally. Working both independently and with their peers, students will practice real world skills in predicting and interpreting the weather. Students will apply their knowledge of weather, weather patterns and the cause and effect relationships of weather and weather systems to a culminating project investigating changes in Earth's climate. Students will be required to use graphs to interpret data and use this data to justify their claims regarding the future of Earth's climate, citing specific references to various locations around the world. *This unit was adapted from OpenScied.*

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
<p>Next Generation Science Standards Performance Expectations: Middle School Earth and Space Sciences</p> <ul style="list-style-type: none"> Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. (MS-ESS2-4) Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. (MS-ESS2-5) 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) Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. (MSESS3-5) 	<p><i>Students will be able to independently use their learning to...</i></p> <p>T1 Make observations and ask questions to define a problem based on prior knowledge and curiosity that stimulates further exploration, analysis, and discovery.</p> <p>T2 Analyze qualitative and quantitative data to interpret patterns, draw conclusions, and/or make predictions.</p> <p>T3 Communicate effectively based on purpose, task, and audience to promote collective understanding and/or recommend actions.</p>	
<p>Next Generation Science Standards (DCI) Science: 6</p> <ul style="list-style-type: none"> Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (ESS2.6.C1) 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. (ESS2.6.C2) Global movements of water and its changes in form are propelled by sunlight and gravity. (ESS2.6.C3) Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (ESS2.6.C4) 	Meaning	
	Understanding(s)	Essential Question(s)
	<p><i>Students will understand that...</i></p> <p>U1 Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time.</p> <p>U2 Scientists record patterns and make predictions of the weather across different times and areas.</p> <p>U3 Climate describes the range of an area's typical weather conditions and the extent to which those conditions vary over long periods of time.</p> <p>U4 Earth's major systems interact in multiple ways to affect Earth's surface materials and processes.</p>	<p><i>Students will keep considering...</i></p> <p>Q1 How does water move through Earth's systems, and what forces drive its continuous cycling?</p> <p>Q2 How do air masses interact to create different weather conditions, and how can we use data to predict the weather?</p> <p>Q3 How do the uneven heating of Earth and its rotation create patterns in atmospheric and oceanic circulation, and how do these patterns influence climate?</p> <p>Q4 What evidence shows that Earth's global temperatures are rising, and what factors are contributing to this change?</p>

Stage 1: Desired Results - Key Understandings

- 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. (ESS2.6.D1)
- Because these patterns are so complex, weather can only be predicted probabilistically. (ESS2.6.D2)
- 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. (ESS2.6.D3)
- 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. (ESS3.6.D1)

Madison Public Schools Profile of a Graduate

- Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)
- Citizenship: Identify, analyze and contribute to critical issues in society in an ethical and responsible manner. (POG.5.1)

- U5** Most of the earth's surface is covered by water in various forms (vapor, oceans, streams, glaciers, etc.)
- U6** Weather patterns are the result of the variations on the earth's surface and in the atmosphere.
- U7** Global climate are the result of the variations on the earth's surface and in the atmosphere.
- U8** The foundation for Earth's global climate systems is a combination of electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space.
- U9** Scientists examine evidence to formulate interesting questions and solve problems.
- U10** Unequal heating and cooling of water, land, and air creates weather and weather patterns.
- U11** Weather can be predicted by analyzing the temperature, movements of air masses, proximity to influencing landforms/water sources, and location.
- U12** Various factors contribute to changes in the Earth's environment which can affect Earth's future.

Acquisition of Knowledge and Skill

Knowledge

Students will know...

- K1** Weather and climate are related but not the same.
- K2** Water continually cycles among land, ocean, and atmosphere.
- K3** Temperature impacts molecular arrangement of molecules.

Skill(s)

Students will be skilled at...

- S1** Explaining how energy from the sun drives the movement of water through evaporation, condensation, precipitation, and runoff.
- S2** Connecting how air masses move from high-pressure to low-pressure regions, leading to changes in weather conditions.

Stage 1: Desired Results - Key Understandings

K4 In the water cycle, condensation occurs due to cooling; evaporation and transpiration occur due to heating.

K5 As air attempts to equalize by moving from high pressure areas to low pressure areas, this causes wind from convection currents.

K6 Solar radiation heats the planet, but it does not do so evenly. Air pressure is influenced by the differences between hotter and cooler pockets of air, or fronts.

K7 Cause and effect relationships may be used to predict weather and climate patterns and changes.

K8 Scientists are investigating a variety of factors that may be causing Earth's climate to change.

K9 Graphs, charts and images can be used to identify patterns in data.

K10 Vocabulary: Precipitation, transpiration, evaporation, condensation, crystallization, density, runoff, temperature, air pressure, particle, atmosphere, Density, temperature, pressure, humidity, precipitation, wind speed, wind direction, air mass, cold/warm front, condensation, evaporation, latitude, altitude, flow, thermometer, barometer, anemometer, dew point, stationary front, occluded front, warm front, cold front, Climate, temperature, atmospheric pressure, density, current, latitude, altitude, Coriolis effect, convection, condensation, precipitation, cloud, water cycle, air mass circulation, vegetation, latitude, longitude, rain shadow, Force, rotation, intensity, physical change, glacial, weather condition, natural resource, natural process, catastrophic, cycle, atmospheric composition, environmental, pollution, societal, renewable resource, nonrenewable, oil, absorb.

S3 Developing and using models to demonstrate how the uneven heating of Earth's surface creates wind and ocean currents.

S4 Identifying how human activities (e.g., fossil fuel combustion, deforestation) and natural factors (e.g., volcanic activity) that contribute to global temperature changes.

S5 Using evidence to explain the relationship between greenhouse gas emissions and rising global temperatures.

S6 Interpreting weather maps, diagrams, and visualizations to predict short-term weather changes.