CCPS Science Unit Plan

Grade	6th	**Subject**	Science	**Unit #**	5
Unit Name	Life as a Meteorologist		**Timeline**	6 weeks	
How to use the Framework	This Framework should be used to implement daily science instruction. The resources and instructional strategies reflected in the Framework will provide a foundation for effective implementation and student mastery of standards. Please see the hyperlinked abbreviation document to ensure understanding of all abbreviations used with this framework.				
Unit Overview	This unit addresses the interaction of atmospheric conditions and the effects of these on weather and climate. The unit emphasizes the role of heat energy from the Sun driving the weather. The unit begins with the phenomena, tornadoes in Georgia and why they are so difficult to predict. It is followed by the phenomena of weather balloons to gain an understanding of the layers of the atmosphere to better understand how weather is predicted. An unequal heating lab is conducted to get an understanding of this driving winds, air pressure, and cloud formation. The unit concludes with a hurricane investigation. The Students should know that the weather is always changing, is difficult to predict, and can be described by measurable quantities such as temperature, wind direction and speed, and precipitation. They should also know that large masses of air with certain properties move across the surface of the Earth. The movement and interaction of these air masses is used to forecast the weather. The physical science element related to heat energy has been integrated in the unit. A concept from physical science is introduced in this unit that will be taught explicitly in 6th grade. In this unit, the students will understand basic principles of heat energy in driving weather systems.				

3Dimensional Instruction

GSE	Science and Engineering Practices	Crosscutting Concepts
S6E4. Obtain, evaluate, and communicate information about how the sun, land, and water affect climate and weather. **A**. Analyze and interpret data to compare and contrast the composition of Earth's atmospheric layers (including the ozone layer) and greenhouse gasses. (Clarification statement: Earth's atmospheric layers include the troposphere, stratosphere, mesosphere, and thermosphere.) **B.** Plan and carry out an investigation to demonstrate how energy from the sun transfers heat to air, land, and water at different rates.	• Asking questions (for science) and defining problems (for engineering) • Obtaining, Evaluating, and Communicating Information • Planning and Carrying Out Investigations • Analyzing and Interpreting Data • Constructing Explanations and Designing Solutions • Engaging in Argument from Evidence	• System and system models • Cause and effect • Patterns • Stability and change • Energy and matter • Scale, proportion, and quantity

	(Clarification statement: Heat transfer should include the processes of conduction, convection, and radiation.) **C.** Develop a model demonstrating the interaction between unequal heating and the rotation of the Earth that causes local and global wind systems. **D.** Construct an explanation of the relationship between air pressure, weather fronts, and air masses and meteorological events such as tornadoes and thunderstorms. **E.** Analyze and interpret weather data to explain the effects of moisture evaporating from the ocean on weather patterns and weather events such as hurricanes. **S8P2d.** Plan and carry out investigations on the effects of heat transfer on molecular motion as it relates to the collision of atoms (conduction), through space (radiation), or in currents in a liquid or a gas (convection).		
NGSS Alignment	NGSS Alignment to Disciplinary Core Ideas		
Weekly Lesson Tasks **Teacher Notes**			

<table>
<tr><th colspan="3">Week 1</th></tr>
<tr><td>GSE:
S6E4 A. Analyze and interpret data to compare and contrast the composition of Earth's atmospheric layers (including the ozone layer) and greenhouse gasses.

(Clarification statement: Earth's atmospheric layers include the troposphere, stratosphere, mesosphere, and thermosphere.)</td><td colspan="2">Focused Concept:
The Earth's Atmosphere is composed of nitrogen (78%), oxygen (21%), and other gases (1%). The atmosphere is a series of layers, with each having its own traits. Weather occurs in the lowest layer of the atmosphere, known as the troposphere. Weather and climate involve the transfer of energy within the atmosphere. Weather is the state of the atmosphere at a particular time and place. Weather is a combination of temperature, air pressure, wind, and moisture. Weather is caused by the uneven heating of the Earth's surface by the sun. Climate is the average weather in a given area over longer periods of time.

Atmosphere
Troposphere
Stratosphere
Mesosphere
Thermosphere
Exosphere
Unequal heating
Density
Ozone Layer
Greenhouse gasses
Temperature</td></tr>
<tr><td>SEP: Analyze and Interpret data</td><td colspan="2">CCC: Cause and Effect; Stability and Change</td></tr>
<tr><td colspan="2">Phenomenon:

Weather balloons are launched into the Earth's atmosphere. Show students an overview video or NWS. Additional website on weather balloons. Provide students with an opportunity to analyze and interpret data to compare and contrast the composition of Earth's atmospheric layers (including the ozone layer) including the troposphere, stratosphere, mesosphere, and thermosphere. Use the scale 1 mm=1 km or allow students to develop their own scale. Students should draw and label the layers and include differences in temperature and density. They should include where clouds are, planes fly, weather balloons go, where the Space Station is, etc.

DQ: How have weather balloons helped us understand the atmosphere?

Layers of the Atmosphere UCAR</td><td>DQ:
How have weather balloons helped us understand the atmosphere?

Why is the Atmosphere Important?</td></tr>
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Layers of the atmosphere
Peeling back the layers of the atmosphere

How can ozone be both helpful and harmful?
Tropospheric ozone
Ozone layer

	Day 1	Day 2	Day 3	Day 4	Day 5
The students will be able to (SWBAT)	**SWBAT** identify and describe the location and composition of each atmospheric layer.	**SWBAT** identify and describe the location and composition of each atmospheric layer.	**SWBAT** analyze and interpret data to compare and contrast the composition of Earth's atmospheric layers, the ozone layer, and greenhouse gasses.	**SWBAT** analyze and interpret data to compare and contrast the composition of Earth's atmospheric layers, the ozone layer, and greenhouse gasses.	**SWBAT** analyze and interpret data to compare and contrast the composition of Earth's atmospheric layers, the ozone layer, and greenhouse gasses.
Opening **The Teacher Will (TTW)** **Student Will (SW)** **See-Think-Wonder Protocol (STW)**	DQ: How have weather balloons helped us understand the atmosphere? TTW open the lesson by showing a Weather Balloon La… demonstrating a weather balloon launch and use the See-Think-Wonder protocol to guide student thinking. After students share their initial ideas and questions, guide them toward these questions. Discussion Question: -Where in the atmosphere does weather occur? -How do temperature and pressure change as a weather balloon moves up through the layers of the atmosphere?	DQ: Why is the Atmosphere Important? TTW open the lesson by showing a short video clip of the Earth's atmosphere from space to generate interest. TTW have students brainstorm what they already know about the Earth's atmosphere in small groups.	TTWopen the lesson by asking students to review what they have learned from the previous lesson. SW engage in a hands-on activity to explore the differences between each atmospheric layer. SW complete ***STEMScopes: Engage (Composition of Earth's Atmosphere)*** activity to demonstrate the mixture of gasses in the atmosphere by creating a human bar graph. Teacher Instructions Wall Card	TTW open the lesson by reviewing key terms related to atmospheric layers and composition using a quick quiz or Kahoot game.	TTW open the lesson by reviewing the basic structure of the Earth's atmosphere. TTWand SW discuss the characteristics and composition of each layer.

	-Why does temperature and pressure change as a weather balloon moves up through the layers of the atmosphere? TTW facilitate a class discussion on the purpose of weather balloons and their importance in studying the atmosphere.				
Guided Practice/ Transition	SW work In groups to analyze data collected from previous weather balloon launches. SW identify patterns in the data and discuss what it might reveal about the atmosphere. TTW encourage students to ask questions and make predictions based on the data. TTW facilitate a class discussion on the purpose of weather balloons and how they collect data about the atmosphere. (Introduce scientific concepts such as air pressure, temperature, and humidity.)	TTW presents a PPT explaining each atmospheric layer in detail. TTW and SW discuss the composition of each layer, including the presence of specific gasses. Introduce the concepts of the ozone layer and greenhouse gasses. Teacher Version Atmospheric Layers Student Version Atmospheric Layers	SW complete the Atmospheric Layers Puzzle in groups. SW combine puzzle pieces to create information cards about each layer of the atmosphere. Teacher Guide Student Guide Student Journal Puzzle Piece	TTW present a visual diagram showing the different atmospheric layers and their compositions. TTW lead a discussion on why each atmospheric layer is important and how they interact with each other.	SW complete Atmosphere Drag and Drop matching the layer of the atmosphere with its composition or distribution. TTW explain the characteristics and composition of each atmospheric layer. Student Google Doc
Independent Practice	SW work in pairs to design their own weather balloon model. Each pair will present their model to the class and explain how weather balloons help us	SW complete *Atmospheric Layers Assess for Understanding* handout. TTW review the Atmospheric Layers Worksheet together as a class, highlighting common mistakes and	SW complete their groups' puzzle and use the information to rotate through puzzles to obtain information to complete the chart on the Student Journal.	TTW break students into pairs and have them create a poster illustrating the different atmospheric layers and their compositions. SW conduct research and	SW complete STEMScopes: CER Scenario Handout- Composition of Earth's Atmosphere Layers. Student Handout Student Google Doc Teacher Rubric

	understand the atmosphere. Virtual Ballooning to Explore the Atmosphere	misconceptions. Atmospheric Layers Assess for Understanding		analyzes data sets comparing the composition of Earth's atmospheric layers, ozone layer, and greenhouse gasses. SW draw and label the layers and include differences in temperature and density. They should include where clouds are, planes fly, weather balloons go, where the Space Station is, etc. (Use the scale 1 mm=1 km or allow students to develop their own scale.)	
Assessment Summary	TOD SW write a short paragraph explaining the importance of weather balloons in studying the atmosphere. TTW evaluate student responses for accuracy.	TOD TTW assess student understanding through an exit ticket where students identify the location and composition of different atmospheric layers. KWL Handout	TOD SW complete the Reflections and Conclusions section. SW present their findings to the class, highlighting key differences and similarities in the composition of the atmospheric layers, ozone layer, and greenhouse gasses. TTW evaluate student responses for accuracy.	TOD SW share their posters with the class and provide peer feedback. Peer assessment of group activities focusing on composition comparison. TTW assess students based on their participation in group discussions, the accuracy of their visual representations, the depth of their analysis of data sets, and their performance on the quiz/exit ticket assessing their understanding of atmospheric layers, ozone layer, and greenhouse gasses.	TOD TTW evaluate student responses for accuracy. TTW assess student understanding through a short common assessment where students identify the location and composition of different atmospheric layers.
Small Group Tasks (TBA)					

Week 2					
GSE: **S6E4 B.** Plan and carry out an investigation to demonstrate how energy from the sun transfers heat to air, land and water at different rates. (Clarification statement: Heat transfer should include the processes of conduction,convection, and radiation.)	**Focused Concept:** The heat source for Earth is the sun. Heat from the sun travels to Earth in a process called radiation. Radiation is the transfer of heat through space without touching any particle; in the case of the sun, this takes place through electromagnetic radiation. Once the heat energy reaches Earth, it is transferred to the land via radiation. Then the land can transfer energy back to the air by conduction and , finally, convection causes the warm air to rise. Water is much slower at gaining heat or losing heat. The process of heat energy transfer to water is much slower because water has a specific heat capacity that is about five times higher than that of the land. Heat energy, like all type of energy, cannot be created nor destroyed, only transferred. The Earth's landmasses and oceans are heated from the sun;s radiation. Weather and climate on Earth are dependent on heat energy transfer. All weather happens because of heat energy transfer. Conduction is due to transfer of heat from one substance to another by direct contact. Convection is due ti heat energy being transferred in a fluid. This heat energy transfer causes unequal heating of the surface of the Earth. This leads to weather patterns. Conduction Convection Radiation Heat Energy ***The teacher will access Module: Weather and Climate - Lesson 1: Solar Energy on Earth for online instruction and assign activities used for the instructional week.***				
SEP: Plan and Carry out an investigation to demonstrate heat energy transfer.	**CCC:** Cause and Effect; Stability and Change; System and System Models				
Phenomenon: **What effect does the Sun have on water?**		**DQ:** How does the heat energy from the Sun drive hurricanes? How does energy transfer from the sun to Earth and the atmosphere? What happens to solar radiation? How do surfaces on Earth affect the atmosphere?			
	Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**

The students will be able to (SWBAT)	**SWBAT** differentiate between conduction, convection, and radiation.	**SWBAT**differentiate between conduction, convection, and radiation.	**SWBAT** explain how heat energy from the sun drives the weather.	**SWBAT** explain how heat energy from the sun drives the weather.	**SWBAT** explain how heat energy from the sun drives the weather.
Opening	DQ: How does the heat energy from the Sun drive hurricanes? TTW open the lesson by showing a short video clip of different weather conditions and ask students to share their observations. aUse a recent hurricane such Isaias, Laura, or Sally (2020) You can use this NOAA archive to assist with before and after imagery. NOAA and NWS also have various resources such as Past Significant Tropical Storms	**(* Located in textbook)** **Engage: Encounter the Phenomenon: Solar Energy on Earth** Phenomenon: What effect does the Sun have on water? TTW open lesson by displaying Go Online Crepuscular Ray video to the class to see the phenomenon in action. SW complete ETP. TTW will discuss what a change in temperature of a material such as water indicates.	DQ: What happens to solar radiation? TTW open the lesson by showing an image of Earth from space. Ask students to identify the two main types of surfaces that cover the Earth. TTW and SW discuss what happens to radiation from the Sun and share their experiences.	DQ: How do surfaces on Earth affect the atmosphere? TTW open the lesson by asking: How do you think a hot, paved road might affect the air above it?	TTW open the lesson reviewing the basic concepts of temperature and energy with a brief quiz.
Guided Practice/Transition	TTW and SW conduct a hands-on activity demonstrating each type of heat transfer. TTW use a lava lamp to demonstrate three ways that heat transfers. Lava lamp (If a lava lamp is not available, show a video clip of a lava lamp, and use another type of lamp for students to feel the heat.) SW record observations and	**(* Located in textbook)** **Explore and Explain** SW complete Go Online Interactive Presentation **Investigation: Catching Some Rays** SW model energy transfer between Sun and Earth TTW model energy transfer between the Sun and Earth. SW observe a model of energy transfer between	**(* Located in textbook)** **Explore and Explain** SW complete Go Online Interactive Presentation **Lab: Warm Up and Cool Down** SW work in groups to develop and use a model to determine whether land or water absorbs and releases more thermal energy. SW explore how different materials absorb thermal energy differently.	**(* Located in textbook)** **Explore and Explain** SW complete Go Online Interactive Presentation **Lab: Hot Air** *Teacher can show a lab video of Hot Air* SW work in groups to develop a model to investigate whether air over Earth's land or water absorbs and releases more thermal energy.	TTW break students into small groups and provide them with scenarios where they have to identify which heat transfer process is at work.

	conduct a think-pair-share with a partner. Teacher Guide SW work in pairs to brainstorm and share examples of conduction, convection, and radiation in their everyday live. TTW and SW facilitate and conduct a short group discussion where students recall and share their understanding of how heat energy moves from one object to another.	the Sun (lamp) and Earth (ice).		TTW facilitate class discussion creating a class master table for students to combine and compare data.	
Independent Practice	SW complete **Pivot Interactive:** Convection in Earth Systems (Only complete Part 1/Part2) **Part 1:** What is Convection? **Part 2:** Convection in the Atmosphere	**(* Located in textbook)** **Explore and Explain** SW Go Online Interactive Presentation **Read About:** 1. How does energy from the sun reach Earth? TTW assign a *Foldable* activity to allow students to take notes throughout the lesson. SW complete **3D Thinking:** How does energy from the Sun reach Earth?	**(* Located in textbook)** **Explore and Explain** SW Go Online Interactive Presentation **Read About:** 1. What happens to solar radiation on Earth? SW added notes to *Foldable* throughout the lesson.	**(* Located in textbook)** **Explore and Explain** SW Go Online Interactive Presentation **Read About:** 1. How do surfaces on Earth affect the atmosphere? SW added notes to *Foldable* throughout the lesson. SW complete **3D Thinking:** How do surfaces on Earth affect? Question # 1-4	SW create a detailed poster or presentation explaining one of the heat transfer processes.
Assessment/Summary	TOD (Writing Prompt) Explain how convection is related to heat transfer. TTW evaluates students' responses for accuracy.	TOD: Compare and contrast convection and radiation.	TOD (Reflection) Summarize the main idea of the paragraph in their own words. TTW evaluates students' responses for accuracy.	**(* Located in textbook)** **Explore and Explain** TOD SW complete **3D Thinking:** How do surfaces on Earth affect?	TOD: Peer feedback. TTW and SW discuss and share a poster if time permits and provide peer review feedback on their understanding of the concepts.

				Question #5 SW develop a model that shadows the rate at which air, water, and land absorb thermal energy from the Sun. TTW evaluates students' responses for accuracy.	Gallery Walk
Small Group Tasks (TBA)					

Week 3	
GSE: **S6E4 C.** Develop a model demonstrating the interaction between unequal heating and the rotation of the Earth that causes local and global wind systems.	**Focused Concept:** Unequal heating of land and water causes various weather events. Wind is the movement of air caused by differences in air pressure. The air moves from areas of high pressure to areas of lower pressure. Temperature differences cause large convection currents to form between the equator and the poles, which means warm air rises from the equator and moves back toward the poles. It then falls toward the Earth because it has lost heat. This is the cause of global wind systems. Of course, the warm air cannot move directly north or south because the Earth is rotating, So, winds in the northern hemisphere curve to the right and winds in the southern hemisphere curve to the left as they move toward their respective poles. This is known as the Coriolis Effect. The Coriolis Effect exists because the different areas on Earth are moving at different speeds because the Earth is round and rotating. So, the north and south pole move slower than the equator to make one full rotation in a 24-hour period. Coriolis Effect Global winds Land breeze Prevailing winds Sea breeze Wind Air mass Cold front ***The teacher will access Module: Weather and Climate - Lesson 2: Atmospheric and Oceanic Circulation for online instruction and assign activities used for the instructional week.***

SEP: Developing and using models	**CCC:** Pattern; Cause and Effect; Energy and Matter; Stability and Change
Phenomenon: **Why is water off the coast of northern California typically colder than water further offshore?**	**DQ:** What causes air and water to flow? What patterns do global winds form? How does unequal heating and the Earth's rotation affect wind patterns?

	Day 11	Day 12	Day 13	Day 14	Day 15
The students will be able to (SWBAT)	**SWBAT** compare and contrast sea breezes and land breezes.	**SWBAT** differentiate between local and global wind systems.	**SWBAT** develop a model demonstrating the interaction between unequal heating and the rotation of the Earth that causes local and global wind systems.	**SWBAT** plan and carry out an investigation to demonstrate how energy from the sun transfers heat to air, land and water at different rates.	**SWBAT** illustrate and observe real-time global air and ocean currents.
Opening	**(* Located in textbook)** **Engage: Encounter the Phenomenon :** **Atmospheric and Oceanic Circulation** Phenomen: Why is water off the coast of northern California typically colder than water further offshore? TTW open the lesson by allowing students to examine the map of water temperature off the coast of California. SW complete ETP. SW watch the video *Between Wind and Water*	DQ: What patterns do global winds form? TTW open the lesson by asking students to share what they learned about energy transfer. TTW review "convection" as the transfer of thermal energy.	DQ: How does unequal heating and the Earth's rotation affect wind patterns? SW brainstorm and share what they already know about wind, including how the wind is formed and its impact on the environment. TTW review basic concepts of the Earth's rotation and its effect on weather patterns.	TTW open the lesson by asking students to complete Coastal Winds and Clouds Gizmo: Prior Knowledge Questions SW discuss their response as a class,	TTW give students 2 minutes to sketch how they imagine wind patterns form due to Earth's rotation and uneven heating. *Activity: Quick Sketch: Wind Systems*

	and record their observations. TTW and SW discuss how the map and video are related.				
Guided Practice/Transition	**(* Located in textbook)** **Explore and Explain** SW Go Online Interactive Presentation **Lab: Moving Air** TTW ask students what they already know about air and how air moves. SW use a model to investigate how differences in air pressure cause air to flow. TTW and SW discuss air pressure.	**(* Located in textbook)** **Explore and Explain** SW Go Online Interactive Presentation **Investigation: Rise and Fall, then Repeat** SW analyze data to identify patterns in global convection cells. TTW read the paragraph about Global Winds.	TTW display Wind movement PPT guiding and allowing students to complete guided notes. Student Handout: Wind Movement Notes	TTW introduce the Gizmo and demonstrates its basic operations. SW complete Coastal Winds and Clouds Gizmo Warm-Up. Teacher Guide: Coastal Winds And Clouds Gizmo	TTW engage students in a virtual activity demonstrating wind patterns based on varying temperatures. TTW will guide students through the story map to demonstrate the basic functions of the simulation. SW observe real-time global air and ocean currents anywhere on the globe. SW zoom in and out to focus on more localized areas or large scale global patterns. SW explain in writing how local and global wind systems are influenced by the interaction of unequal heating and the rotation of the Earth. Simulation Story Map Link Simulation Link
Independent Practice	**(* Located in textbook)** **Explore and Explain** SW Go Online Interactive Presentation **Read About**:	**(* Located in textbook)** **Explore and Explain** SW Go Online Interactive Presentation **Investigation: It's a**	TTW Show this video to students and then have them complete the Global Winds activity, in which they will make a 2-D model drawing of	SW complete ***Coastal Winds and Clouds*** -Student Exploration **Activity A** : Students observe temperature	**Common Assessment 8 on Illuminate**

	1. Why does air flow? 2. The Flow of Air 3. Temperature and Air Pressure **Investigation: It's a Breeze** SW watch the animation Sea Breezes and Land Breezes.	**Blowin'** SW use models to describe global wind systems. SW observe real-time global air and ocean currents anywhere on the globe. SW zoom in and out to focus on more localized areas or large-scale global patterns. SW explain in writing how local and global wind systems are influenced by the interaction of unequal heating and the rotation of the Earth.	global winds. Current Events: Crash C…	variations in marine air and inland air. Students can then make a connection between temperature and wind. **Activity B:** Students document temperature patterns and convection currents during the day and at night. Student Handout PDF Student Handout Google Doc TTW monitor and facilitate the Gizmo.	
Assessment/Summary	TOD **(* Located in textbook)** **Explore and Explain** SW complete **3-D Thinking:** Why does air flow? TTW evaluate students' responses for accuracy.	TOD **(* Located in textbook)** **Explore and Explain** SW complete **3-D Thinking:** What patterns do global winds form? TTW evaluate students' responses for accuracy.	TOD Writing Prompt: Explain how unequal heating and the rotation of the Earth contribute to the formation of local and global wind systems. TTW evaluate students' responses for accuracy.	TOD: Peer Feedback SW share their findings with the class and encourages peer feedback and discussion. .	TOD TTW and SW review Common Assessment 8.
Small Group Tasks (TBA)					

Week 4					
GSE: **S6E4 D.** Construct an explanation of the relationship between air pressure, weather fronts, and air masses and meteorological events such as tornadoes and thunderstorms.	**Focused Concept:** Weather is the current condition of the atmosphere at a certain time and place. Large bodies of air with similar temperatures and moisture are referred to as an air mass. Two air masses of different temperatures usually do not mix when they meet, but instead form a front. Cold fronts may produce intense, narrow storms, while warm fronts might produce widespread rain. Sudden changes in air pressure can cause thunderstorms and tornadoes as a fast-moving cold front hits a slowing-moving warm front. Wind Air Masses Cold front Occluded front Polar masses Relative humidity Stationary front Thunderstorm Tornado Warm front ***The teacher will access Module: Weather and Climate - Lesson 3: Weather Patterns for online instruction and assign activities used for the instructional week.***				
SEP: Construct an Explanation	**CCC:** Patterns; Cause and Effect; Systems and System Models; Energy and Matter				
Phenomenon: What causes air and water to flow?	**DQ:** How do the interactions of air masses cause changes in weather conditions? How do pressure differences affect weather? What happens when air masses meet?				
	Day 16	**Day 17**	**Day 18**	**Day 19**	**Day 20**
The students will be able to (SWBAT)	**SWBAT** describe what causes weather to change.	**SWBAT** identify the types of air masses based on their area of formation and characteristics.	**SWBAT** identify the types of air masses based on their area of formation and characteristics.	**SWBAT** describe how weather fronts are the result of air masses colliding.	**SWBAT** -Compare and contrast cold fronts and warm fronts. -Explain how the weather might change as a cold or warm front passes through.

Opening	**(* Located in textbook)** **Science Probe: Air Pressure Ideas** TTW use this science probe to assess students' prior knowledge of the lesson content and to identify possible preconceptions. **Engage: Encounter the Phenomenon: Weather Patterns** Phenomenon: What causes air and water to flow? Show Go Online Storm Front video to the class to see the phenomenon in action. SW complete Encounter the Phenomenon. TTW discuss the basic terms described in the video.	TTW open the lesson asking students to predict what they will see and learn from the video about air masses.	DQ: How does pressure differences affect weather? TTW open the lesson by reviewing from the previous day's lesson on Air Masses and Pressure.	DQ: What happens when air masses meet? TTW open the lesson by asking students what do you think might happen if these air masses bump into each other.	TTW open the lesson asking students to complete Weather Map Gizmo: Prior Knowledge Questions. SW discuss their response as a class.
Guided Practice/Transition	**(* Located in textbook)** **Explore and Explain** SW complete Go Online Interactive Presentation **Investigation: Describing Weather** SW work in partners/groups to research weather variables, then organize and communicate their results. SW read Weather Factors and write a definition of	**(* Located in textbook)** **Explore and Explain** SW complete Go Online Interactive Presentation **Investigation: Characteristics of Air Masses** SW observe air masses and investigate how they affect weather. SW watch the video ***Air Masses*** and take notes.	**(* Located in textbook)** **Explore and Explain** SW complete Go Online Interactive Presentation **Investigation: Pressure Changes** SW complete model and use it to describe the relationship between distribution of air molecules and air pressure TTW explain that weather is often associated with	**(* Located in textbook)** Explore and Explain SW complete Go Online Interactive Presentation **Investigation: Air Mass Collision Course** SW design and use a model to show what happens when air masses interact at a front. TTW explain "fronts" how their movements affect local weather patterns.	TTW introduce the Gizmo and demonstrates its basic operations. SW complete Weather Map Gizmo Warm-Up. Teacher Guide: Weather Map Gizmo

	weather in their own words. TTW review students' research for accuracy.	TTW discuss the main concept of the video and clarify any misconceptions as it relates to the term air masses.	pressure systems. **Read About:** 1. How do differences in pressure affect weather? SW add to *Foldable* notes. TTW discuss what students learned from the investigation as it relates to the reading.	**Read About**: 1. What happens when air masses meet? SW add to *Foldable* notes. TTW review fronts and SW underline weather associated with each type of front.	
Independent Practice	**(* Located in textbook)** **Explore and Explain** SW complete Go Online Interactive Presentation **Lab: Feel the Air** SW use a model to visualize unobservable mechanisms. SW collect data and infer how Earth's surface affects the air above it.	**(* Located in textbook)** **Explore and Explain** SW complete Go Online Interactive Presentation **Close Reading:** **Read a Scientific Text: Jet Stream and Weather** SW critically read a scientific text and annotate highlighting the evidence that supports the influence of the jet stream on air masses. SW independently complete ***Make Connection,*** researching to learn how the jet stream affects California's weather.	**(* Located in textbook)** **Explore and Explain** SW complete Go Online Interactive Presentation **Investigation: Highs and Lows** SW investigate how air pressure systems interact to affect weather patterns.	**(* Located in textbook)** **Explore and Explain** SW complete Go Online Interactive Presentation **Investigation**: **Come Rain or Shine** SW interpret data on a map and infer the causes of weather conditions.	SW complete Weather Map Gizmo -Student Exploration. **Activity C** – Students investigate cold fronts and warm fronts. Student Handout PDF Student Handout Google Doc
Assessment/Summary	TOD: SW analyze and conclude **Lab**: Feel the Air TTW evaluate students' responses for accuracy.	TOD: How do air masses contribute to weather? TTW evaluate students' responses for accuracy.	TOD: Writing Prompt: Explain air pressure and its effect on weather. TTW evaluate students' responses for accuracy.	TOD: How do the conditions of air masses cause weather? TTW evaluate students' responses for accuracy.	TOD: Reflective Writing: Describe what the weather would be like as a warm front passes. Then, describe what would occur as a cold front passes. TTW evaluate students'

					responses for accuracy.
Small Group Tasks (TBA)					

Week 5	
GSE: **S6E4 D.** Construct an explanation of the relationship between air pressure, weather fronts, and air masses and meteorological events such as tornadoes and thunderstorms. **S6E4 E.** Analyze and interpret weather data to explain the effects of moisture evaporating from the ocean on weather patterns and weather events such as hurricanes.	**Focused Concept:** Oceans around the equator end up absorbing much more of the sun's radiation. Then, the heat is distributed from the weather in the equator around the Earth by the Ocean currents. This allows from the regional temperature that Earth currently has. If the ocean did not function in this way, the regional temperatures would be much more extreme, with the equator remaining very hot and the areas away from the equator being very cold. However, this is not the only way that oceans distribute heat. As the ocean heats, the water molecules move more quickly until they evaporate into the air. As more and more water vapor enters the air, it causes rain and storms to begin to form. These areas that have a high content of water vapor, rain, or storms are then pushed by the trade winds to other areas of the Earth. One weather event that is common in areas of warm ocean with a lot of precipitation is hurricanes. Hurricanes are fueled by evaporation, develop over warm ocean water, and require the input of wind at the correct angle to cause a rotation. Wind Air Masses Cold front Occluded front Polar masses Relative humidity Stationary front Thunderstorm Tornado Tropical mass Warm front Hurricanes ***The teacher will access Module: Weather and Climate - Lesson 3: Weather Patterns for online instruction and assign activities used for the instructional week.***
SEP: Analyzing and interpreting data	**CCC:** Cause and Effect; Systems and Systems Models; Energy and Matter; Stability and Change
Phenomenon: What causes severe weather such as thunderstorms and tornadoes?	**DQ:** How do air pressure, weather fronts, and air masses lead to the formation of meteorological events such as tornadoes and thunderstorms?

			What are key characteristics and impacts of these extreme weather phenomena?		
	Day 21	**Day 22**	**Day 23**	**Day 24**	**Day 25**
The students will be able to (SWBAT)	**SWBAT** -Construct an explanation of the relationship between air pressure, fronts, and air masses and meteorological events such as tornadoes and thunderstorms. -Define a tornado based on its formation. -Define a thunderstorm based on its formation.	**SWBAT** construct an explanation of the relationship between air pressure, fronts, air masses and meteorological events such as tornadoes and thunderstorms.	**SWBAT** analyze and interpret weather data.	**SWBAT** analyze and interpret data to explain the effects of moisture evaporating from the ocean on weather patterns and weather events such as hurricanes.	**SWBAT** analyze and interpret data to explain the effects of moisture evaporating from the ocean on weather patterns and weather events such as hurricanes.
Opening	DQ: How do air pressure, weather fronts, and air masses lead to the formation of meteorological events such as tornadoes and thunderstorms? What are the key characteristics and impacts of these extreme weather phenomena? TTW assemble the tornado models for students to make observations. (Optional) TTW open the lesson demonstrating or showing a video of a tornado model. Cyclone Tube Tornado in…	SW engage in a review game - *Air Masses and Fronts: I Have, Who Has?* TTW facilitate the game clearing up any misconceptions. Game Instruction/Material	DQ: How do meteorologists predict weather? TTW open the lesson the asking students if the weather forecast is always accurate? Why or Why not?	TTW introduce the phenomenon: ***ADI: Predicting Hurricane Strengths*** Your goal in this investigation is to develop a conceptual model that can be used to explain why wind speed inside a hurricane changes over time. Once you have developed your model, you will need to test it to determine whether you can use it to make accurate predictions about how the strength of several hurricanes	TTW and SW discuss the phenomenon for the lesson/lab. Review Investigative Proposals

	Materials, for each tornado: 1. Plastic tornado tube connector 2. clear plastic 1-liter bottles 3. Red lamp oil 4. Water SW complete Asking Questions Graphic Organizer while making observations of the model.			changed over time in the past. The guiding question of this investigation is: *How can someone predict changes in hurricane wind speed over time?* **Stage 1:** SW watch a video about a hurricane simulation laboratory at the University of Miami, where researchers model hurricanes of various strengths with the goals of more accurately forecasting hurricane warnings and saving lives. Storm simulator … SW then share what they noticed while they watched the video. Students develop a conceptual model that helps them figure out how hurricanes form and what drives hurricane strength, speed, and path. Student Handout - 1.0	
Guided Practice/ Transition	SW complete Multimodality Stations: Severe Weather (listening, reading, and speaking, in that order). **Listening Station:** Students will read over the questions on the Listening Station Handout. Access the link for the video What's With Weather Fr…	TTW display a video clips showing tornadoes and thunderstorms. Tornado Clip Thunderstorm Clip TTW and SW have a class discussion on the formation and	**(* Located in textbook)** **Explore and Explain** SW complete Go Online Interactive Presentation **Lab: Predicting Weather** SW collect and analyze weather data in order to predict the weather.	Day 1 of 3-Day Lesson **Stage 2:** SW read, annotate, and be introduced to ideas such as weather, climate, ocean temperatures, hurricane categories, and energy transformation. SW also work with other members of their group to	Day 2 of 3-Day Lesson **Stage 4: Do** SW use an embedded simulation, "NOAA Historical Hurricane Tracks" to collect data for the guiding question and record the data on their handouts. They then make sense of the data in their

	and turn on the closed captions before watching the video. Have students watch the video multiple times to complete the handout and answer the questions with their partners. **Reading Station:** Students will access the Readworks articles (1. Weather Fronts and 2. Tornadoes) using internet access. Students will read independently and listen to the article with the narration provided or read with a partner. Students will complete the Reading Station Handout. Students will use text evidence to answer each question. **Speaking Station:** Students will work in pairs. One student will have all the cards with the vocabulary terms, and the other student will have all the cards with the descriptions/definitions. Students will take turns reading aloud the term or description and identifying the best matches. Once the teacher has verified that the matches are correct, the student will complete the vocabulary term chart. Write the terms and definitions from the cards. Then, students will discuss and arrive at a consensus of how to illustrate each term. Handout (p-9-17) Handout Link	characteristics of tornadoes and thunderstorms. TTW and SW complete the Case study: Analyzing a historical tornado event of the teacher's choice and its impact.		identify the ideas that they think will be the most helpful or useful as they attempt to develop a conceptual model that can be used to explain why wind speed inside a hurricane changes over time. Video: Hurricane Intensity Scale-The Saffir-Simpson scale Student Handout- 2.0	small groups by creating tables or graphs on their handouts or using Google Sheets or Microsoft Excel to create tables or graphs. Simulation Link Student Handout - 4.0 Student Handout - 4.1
Independent Practice	SW work with a partner to complete the Constructing Explanations Graphic Organizer.	SW complete ***STEM Scopes - Writing*** Science handout.	**(* Located in textbook) Explore and Explain** SW complete ***Analyze and Conclude*** after they	SW work in their groups to create an investigative plan for their investigations.	SW create an evidence-based argument and communicate their findings to their peers.

	SW brainstorm ideas of how to explain the formation of tornadoes and thunderstorms using evidence from the listening, reading, and speaking stations. SW work independently to construct an explanation for the following research questions. Writing Station	SW explain how meteorologists use air pressures, fronts, and air masses to predict future weather events. Student Handout	complete the lab. SW complete Go Online Interactive Presentation **Read About:** 1. How do meteorologists predict the weather 2. Forecasting TTW assign a Foldable activity to take notes.	**Stage 3: Plan** You will use the NOAA Historical Hurricane Tracks website during this investigation to help you figure out an answer to the following question: *How can someone predict changes in hurricane wind speed over time?* Watch a video that will show you how to use the simulation. Video Link (start at 0:42 - end at 2:14) SW share their proposals with another group or the teacher to determine if they are ready to advance to the research-gathering stage of the investigation. SW revise and improved their plans where recommended. Student Handout- 3.0	**Stage 5: Share** SW give and receives feedback during the argumentation session. SW revise their arguments to make them stronger based on the feedback they received during the argumentation session. Student Handout - 5.0
Assessment Summary	TOD: Compare the formation of thunderstorms and tornadoes.	As a group discuss observations from the case study.	(*** Located in textbook**) **Explore and Explain** SW complete **3-D Thinking: How do meteorologists predict the weather?**	TOD: What successes and challenges did your the group have during the planning phase?	TOTD: Why is it important to have a plan for an investigation?
Small Group Tasks (TBA)					

Week 6					
GSE: **S6E4 A**. Analyze and interpret data to compare and contrast the composition of Earth's atmospheric layers (including the ozone layer) and greenhouse gasses. (Clarification statement: Earth's atmospheric layers include the troposphere, stratosphere, mesosphere, and thermosphere.) **S6E4 B.** Plan and carry out an investigation to demonstrate how energy from the sun transfers heat to air, land, and water at different rates. (Clarification statement: Heat transfer should include the processes of conduction, convection, and radiation.) **S6E4 C.** Develop a model demonstrating the interaction between unequal heating and the rotation of the Earth that causes local and global wind systems. **S6E4 D.** Construct an explanation of the relationship between air pressure, weather fronts, and air masses and meteorological events such as tornadoes and thunderstorms. **S6E4 E.** Analyze and interpret weather data to explain the effects of moisture evaporating from the ocean on weather patterns and weather events such as hurricanes. **S8P2d.** Plan and carry out investigations on the effects of heat transfer on molecular motion as it relates to the collision of atoms (conduction), through space (radiation), or in currents in a liquid or a gas (convection).		**Focused Concept:** Review Week - Unit Assessment			
	Day 25	**Day 27**	**Day 28**	**Day 29**	**Day 30**
The students will be able to (SWBAT)	**SWBAT** analyze and interpret data to explain the effects of moisture evaporating from the ocean on weather patterns and weather events such as hurricanes.				

Opening	TTW and SW discuss the phenomenon for the lesson/lab - have students share their final thoughts on the lesson phenomenon.	Unit 5 Assessment Review - See Assessment Prep	Unit 5 Assessment Review - See Assessment Prep	Unit 5 Assessment Review - See Assessment Prep	**Unit 5 Assessment**
Guided Practice/ Transition	Day 3 of 3 Lesson **Stage 6: Reflect** Students will discuss what they know about the disciplinary core ideas they used during the investigation and how these ideas can be used to make sense of other phenomena or related problems. SW discuss some possible explanations in your groups, and then be ready to share your explanations with the rest of the class. Use your handout to keep track of any ideas from the discussion that you think are important to remember or will be useful in the future. SW identify the strengths and weaknesses of their group's performance during the investigation and set goals to make their next investigation more productive. Student Handout- 6.0	Unit 5 Assessment Review - TTW introduce Unit 5 Study Guide. (TTW create study guide based on Unit 5 assessment in Illuminate.)	Unit 5 Assessment Review - See Assessment Prep Unit 5 Assement P…	Unit 5 Assessment Study Guide Review.	Unit 5 Assessment
Independent Practice	**Stage 7: Report** (CER) SW complete their final, revised CER for the investigation.	Unit 5 Assessment Review SW complete Unit	Unit 5 Assessment Study Guide Review	Unit 5 Assessment Review - Study Guide	Unit 5 Assessment on Illuminate.

	Student Handout- 7.0	Assessment Study Guide to prepare for assessment.			
Assessment Summary	SW revises their reports before you submit it to the teacher for a final grade.	TOD: Assessment Practice Question of teachers choice (Reflective).	TOD: Assessment Practice Question of teachers choice (Multiple Choice).	TOD: SW: (Reflection) How will you prepare for tomorrow's unit assessment?	TOD SW answer reflection question: 1. What did you think about the assessment? 2. How well did you know the material? **3.** What activities and tasks helped you for the test?

Assessment Prep

Prepare students for assessment by reviewing the following Assessment Prep Presentation.

Unit 5 Assement Prep

Provide the following guidance:

Ask the students to use what they know about the tasks completed to answer the provided assessment prep question.

- What is the question asking you?
- What do you know about the vocabulary or concept in the question?
- Is this question similar to any investigations or tasks we've completed?
- How can what you've done help you answer this question?
- Just view the assessment question: What is the question asking you?

Guide students to think about how their experience connects to the question.

Using the answer choices provided, ask the students the following:

- Identify a wrong answer: How do I know this answer is incorrect?
- Identify the right answer: How do we know this answer is correct?

Allow the students time to discuss in collaborative groups.

TEACHER NOTE: If students struggle with the question, review it the next day. Do not rush to the next question; instructional time is the only time they have to prepare for the end-of-year assessment.

Labs / Investigations		
Mandatory Labs	**Explore Learning Gizmo**	**Pivot Interactives/Phet**
Lab: Warm Up and Cool Down Lab: Hot Air Lab: Feel the Air Lab: Predicting Weather ADI: Predicting Hurricane Strengths	Coastal Winds and Clouds Gizmo Weather Map Gizmo	Pivot Interactive: Convection in Earth Systems

Additional Resources/Tasks	
Supplemental Resources	Department of Science Guidance Document