Subject: Earth Science	Grade: 10	Unit #: 3	Title: Meteorology

UNIT OVERVIEW

STAGE ONE: Identify Desired Results

Established Goals/Standards

2.2a – 2.2d

2.1a-2.1i

Long-Term Transfer Goal

At the end of this unit, students will use what they have learned to independently…
Apply their understanding of meteorology by using scientific tools and technology appropriately and effectively in order to observe patterns and make predictions about future weather conditions.

Meaning

Enduring Understandings
Students will understand that…

U1. Differential heating of Earth's surface causes variation of density in Earth's atmosphere

U2. Variation in densities is what drives the changing weather

U3. Weather variables are collected and studied to understand past, present, and future weather patterns.

U4. Maps and scientific tools help us make predictions

Essential Questions
Students will consider such questions as…

1. How has Rochester changed throughout time and how do we know?
- How does weather happen in Rochester, NY?
- Why doesn't every location in New York have the same weather at the same time?
- How does the weather (wo)man know what's going on?

Acquisition

What knowledge will students learn as part of this unit?

1. The transfer of heat energy within the atmosphere, the hydrosphere, and Earth's interior results in the formation of regions of different densities. These density differences result in motion.

2. Weather patterns become evident when weather variables are observed, measured, and recorded. These variables include air temperature, air pressure, moisture (relative humidity and dewpoint), precipitation (rain, snow, hail, sleet, etc.), wind speed and direction, and cloud cover.

What skills will students learn as part of this unit?

1. Scholars will use models to represent and revise their thinking overtime.
2. Scholars will make qualitative and quantitative observations
3. Scholars will make predictions based on observations and data
4. Scholars will ask questions based on observation and data
5. Scholars will use and become proficient with certain tables and diagrams in the Earth Science Reference Tables.
6. Scholars will look at maps to predict climate
7. Scholars will create a model for climate change
8. Scholars will create models representing energy transfer
9. Scholars will read weather maps to forecast the weather

		3. Weather variables are measured using instruments such as thermometers, barometers, psychrometers, precipitation gauges, anemometers, and wind vanes. 4. Weather variables are interrelated. For example: ¥ temperature and humidity affect air pressure and probability of precipitation ¥ air pressure gradient controls wind velocity. 5. Air temperature, dewpoint, cloud formation, and precipitation are affected by the expansion and contraction of air due to vertical atmospheric movement. 6. Weather variables can be represented in a variety of formats including radar and satellite images, weather maps (including station models, isobars, and fronts), atmospheric cross-sections, and computer models. 7. Atmospheric moisture, temperature and pressure distributions; jet streams, wind; air masses and frontal boundaries; and the movement of cyclonic systems and associated tornadoes, thunderstorms, and hurricanes occur in observable patterns. Loss of property, personal injury, and loss of life can be reduced by effective emergency preparedness. 8. Seasonal changes can be explained using concepts of density and heat energy. These changes include the shifting of global temperature zones, the shifting of planetary wind and ocean current patterns, the occurrence of monsoons,	10. Scholars will create a weather map out of weather variables and present it to the public 11. Scholars will describe and diagram what happens when a substance is heating both macro and microscopically and how this creates convection cells.

		hurricanes, flooding, and severe weather. 9. Insolation (solar radiation) heats Earth's surface and atmosphere unequally due to variations in: ¥ the intensity caused by differences in atmospheric transparency and angle of incidence which vary with time of day, latitude, and season ¥ characteristics of the materials absorbing the energy such as color, texture, transparency, state of matter, and specific heat ¥ duration, which varies with seasons and latitude. 10. The transfer of heat energy within the atmosphere, the hydrosphere, and Earth's surface occurs as the result of radiation, convection, and conduction. ¥ Heating of Earth's surface and atmosphere by the Sun drives convection within the atmosphere and oceans, producing winds and ocean currents. 11. Temperature and precipitation patterns are altered by: ¥ natural events such as El Ni–o and volcanic eruptions ¥ human influences including deforestation, urbanization, and the production of greenhouse gases such as carbon dioxide and methane.	

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STAGE TWO: Determine Acceptable Evidence	
	Assessment Evidence
Criteria for/to assess understanding: *(This is used to build the scoring tool.)* **1. Understanding of mechanisms that cause weather** **2. Identify, collect, and analyze necessary weather variables needed to give an accurate forecast** **3. Understanding of global and local air movement** **4. Ability to read and create station models** **5. Ability to read and create weather maps**	Performance Task focused on Transfer: For this performance task scholars will apply their understanding of meteorology to create a weather forecast that demonstrates the skills of a meteorologist and knowledge of weather and the factors that cause weather. Other Assessment Evidence: • Daily bridge activities • Daily summary narratives (Claim/Evidence/Connections Sheet) • Ticket out the door, daily closure questions • Daily reflective tool • Two formal NYS style assessments • Bi-weekly NYS style quiz • Academic circles held in class (Think, Pair, Share) • Gallery Walks • BBKs

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T, M, A *(Code for Transfer, Meaning Making and Acquisition)*	**STAGE THREE: Plan Learning Experiences**	
	Learning Events: 1. Introduce final project 2. Creation of climograph-scholars will look at key variables used to define climate 3. Layers of the atmosphere- scholars will familiarize themselves with the characteristics of the atmosphere 4. Lab on insolation in relation to latitude – scholars will do a lab on how latitude affects insolation 5. Lab on absorption based on color –scholars will do a lab on how color affect absorptions rates 6. Lab on absorption based on material – scholars will do a lab on how material affects absorption rate in terms of specific heat 7. Phase change – scholars will look at phase change in water in terms of heat energy gained and loss 8. Water Cycle – scholars will look at why and how water moves throughout earth 9. Porosity/Permeability – scholars will familiarize themselves with the factors that affect movement of water 10. Groundwater 11. Water contamination – scholars will look at current events and how humans impact the water cycle 12. Air movement – scholars will determine if air can apply a force and relate understanding of density to why air moves 13. Convection Cells 14. Planetary Winds – scholars will look at air movement on a global scale and be able to explain why it is happening 15. Land/Sea Breeze – scholars will look at air movement on a local scale 16. Ocean Currents	Evidence of learning: *(formative assessment)* • Daily bridge activities • Daily summary narratives (Claim/Evidence/Connections Sheet) • Ticket out the door, daily closure questions • Two formal NYS style assessments. • Collaborative conversations held in class • Gallery Walks • Workshop activities • 5 week revisits of EQ • Labs • Maps created in class

	17. Hurricanes – scholars will track a hurricane and use data to explain what variables strengthen and weaken a hurricane 18. Reintroduce Project – share criteria/look at rubric 19. Air mass – scholars will look at the characteristics of specific air masses 20. Front –Scholars will explore what happens when two air masses collide 21. Dew Point – scholars will do a lab to determine dew point 22. High Pressure vs. Low Pressure 23. Weather Tools – scholars will familiarize themselves with the tools that measure weather variables 24. Station Models – scholars will be able to use universal weather symbols to understand information shared on a weather map 25. Weather Maps – scholars will create their own weather maps when provided weather variables.	