

Catasauqua Area School District Planned Course of Study

Course Title: Meteorology

Grade Level(s): 9th through 12th

Text: Nese, J.M., Greci, L.M., Babb, D. (2018). *A World of Weather: Fundamentals of Meteorology*. Kendall Hunt Publishing (Teacher Copy Only, No Student Copies)

Course Description

The meteorology course, “An Introduction to Meteorology”, is an introductory high-school level course that will introduce students to the most basic and fundamental concepts of meteorology. Meteorology is the study of weather and in this course, students will learn how global atmospheric winds drive the weather on Earth. Students will learn about the various layers of the atmosphere including an analysis on the air we breathe. Students will then learn how differential heating on Earth leads to uprising currents of air that eventually form clouds and precipitation. In addition, students will learn about tropical weather, winter weather, and severe weather including an in-depth look at just how a tornado forms. Students will be required to apply concepts learned in class to lab assignments, where students will analyze weather data and weather situations just like a real meteorologist. In this course students will also take regular observations of weather and have the opportunity to produce weather forecasts as if they were a meteorologist.

Essential Questions

1. What are the layers of the atmosphere?
2. How does the change of seasons impact temperature around the world?
3. What are some global/local influencers of temperature around the world?
4. What role does water play in influencing temperature and weather patterns around the world?
5. How do clouds form and what are the different types of clouds?
6. What are global patterns of pressure and how do they influence our weather?
7. What is the difference between a stable and unstable atmosphere?
8. How do thunderstorms form?
9. How do hurricanes form and what separates them from tropical storms?
10. What is the life cycle of a mid-latitude cyclone and what impact does it have on the weather?
11. What are the different types of severe weather?
12. What is the difference between the various types of wintry precipitation?

Competencies

- Apply knowledge from Physical Science to explain what our atmosphere is made up of.
- Describe how meteorologists predict the weather by using various tools and weather charts.
- Describe how temperature patterns and gradients aid in driving various global and local weather patterns across the world.
- Explain how water plays a significant role in the creation of weather patterns, including the formation of precipitation.
- Classify clouds into three specific categories: low clouds, middle-level clouds, and high-level clouds.
- Integrate knowledge of how temperature patterns affect weather patterns with knowledge of pressure to paint a complete picture of how global/local weather patterns are established.
- Investigate how thunderstorms form from atmospheric instability and sometimes eventually lead to severe weather.
- Classify tropical weather systems into tropical depressions, tropical storms, and hurricanes.
- Summarize the characteristics of major winter storms including lake effect snow.

Career Awareness, Career Education, & Focus on Employability Skills

Students will use the skills of collaboration, communication, creativity, teamwork, and critical thinking in lab exercises working in small groups where they will be tasked as “meteorologists” and have to create a weather depiction of the atmosphere given certain weather conditions.

Students will use skills such as time management with various assignments where they have to complete a hand analysis of the atmosphere or issue a severe weather warning by a certain deadline to simulate real-world meteorology scenarios.

In collaboration with the school’s career facilitator, students will be given the chance to explore the career fields of science and more specifically, meteorology and will also be allowed the opportunity to chat virtually with a real meteorologist that will offer insights into various career fields in meteorology.

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Course Syllabus

Course Content	Tentative Timeframe	Assessment Anchors	State Standards
Meteorology Introduction <ul style="list-style-type: none"> ● What is meteorology? ● Atmospheric Gases ● Latitude & Longitude ● Time Zones ● Station Models ● Isoplething 	8 days	N/A	3.3.10.A3 3.3.10.A6 3.3.10.A7 3.3.10.A8 3.3.12.A1 3.3.12.A7
The Global Ledger of Heat Energy <ul style="list-style-type: none"> ● Radiation ● Layers of the Atmosphere ● Conduction, Convection 	6 days	N/A	3.2.10.B3 3.2.10.B5 3.2.10.B7 3.3.10.A3 3.3.10.A6 3.3.10.A7 3.3.10.A8 3.3.12.A1 3.3.12.A4 3.3.12.A6 3.3.12.A7
Global and Local Controllers of Weather <ul style="list-style-type: none"> ● The Four Seasons ● Temperature & Elevation ● Urbanization ● Clouds/Snow Cover ● Thermometers 	8 days	N/A	3.3.10.A3 3.3.10.A5 3.3.10.A6 3.3.10.A7 3.3.10.A8 3.3.12.A1 3.3.12.A6 3.3.12.A7
The Role of Water in Weather <ul style="list-style-type: none"> ● Water Vapor ● Hydrologic Cycle ● Clouds ● Fog/Smog/Contrails 	8 days	N/A	3.2.12.B5 3.3.10.A3 3.3.10.A4 3.3.10.A5 3.3.10.A6 3.3.10.A7 3.3.10.A8 3.3.12.A1 3.3.12.A7

Surface Patterns of Pressure & Wind <ul style="list-style-type: none"> • What is pressure? • Low Pressure Systems • High Pressure Systems • Pressure Gradient Force • Coriolis Effect • Surface Friction • Sea & Land Breezes 	10 days	N/A	3.2.12.B5 3.3.10.A3 3.3.10.A4 3.3.10.A5 3.3.10.A6 3.3.10.A7 3.3.10.A8 3.3.12.A1 3.3.12.A7
Upper Air Patterns of Pressure & Wind <ul style="list-style-type: none"> • Hydrostatic Balance • Constant Pressure Surfaces • Ridges & Troughs • Geostrophic Wind • Global Winds • Jet Stream 	8 days	N/A	3.3.10.A3 3.3.10.A6 3.3.10.A7 3.3.10.A8 3.3.12.A1 3.3.12.A7
Stability <ul style="list-style-type: none"> • Relative Humidity • Atmospheric Stability • Stable vs. Unstable • Buoyancy • Lapse Rates • Inversions 	8 days	N/A	3.3.10.A3 3.3.10.A6 3.3.10.A7 3.3.10.A8 3.3.12.A1 3.3.12.A7
Thunderstorms <ul style="list-style-type: none"> • POP • Air Mass Thunderstorms • Lightning • Thunder • Supercell Thunderstorms • Squall Lines 	6 days	N/A	3.2.12.B5 3.3.10.A3 3.3.10.A4 3.3.10.A6 3.3.10.A7 3.3.10.A8 3.3.12.A1 3.3.12.A7
Mid-Latitude Cyclone Model <ul style="list-style-type: none"> • Air Masses • Fronts • Theory of Mid-Latitude Cyclones • Jet Stream's Paradise 	10 days	N/A	3.2.12.B5 3.3.10.A3 3.3.10.A4 3.3.10.A6 3.3.10.A7 3.3.10.A8 3.3.12.A1 3.3.12.A7
Severe Weather/Tornadoes <ul style="list-style-type: none"> • Downbursts • Microbursts • Tornadoes • Enhanced Fujita Scale • Severe Wx Safety 	6 days	N/A	3.2.12.B5 3.3.10.A3 3.3.10.A4 3.3.10.A6 3.3.10.A7 3.3.10.A8 3.3.12.A1 3.3.12.A7

<p>Tropical Weather</p> <ul style="list-style-type: none"> ● Hurricane Overview ● Saffir-Simpson Scale ● Hurricane Structure ● Storm Surge ● Energy Sources for Hurricanes 	6 days	N/A	<p>3.2.12.B5 3.3.10.A3 3.3.10.A4 3.3.10.A5 3.3.10.A6 3.3.10.A7 3.3.10.A8 3.3.12.A1 3.3.12.A7</p>
<p>Winter Weather</p> <ul style="list-style-type: none"> ● What Makes a Winter Storm ● Types of Snowstorms ● Nor'Easters ● Blizzards ● Types of Precipitation ● Ice Storms ● Lake Effect Snow 	6 days	N/A	<p>3.2.12.B5 3.3.10.A3 3.3.10.A6 3.3.10.A7 3.3.10.A8 3.3.12.A1 3.3.12.A7</p>

Teaching Strategies Utilized

- Demonstrations
- Group Lab Exercises
- Inquiry Based Learning
- Written Reports
- Computer Analysis and Simulation
- Modeling
- Class and Group Discussions
- Lecture
- Problem Solving
- Active Learning
- Web Searches
- Scientific Method

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<p><u>Meteorology Overview</u></p> <p><i>The student will be able to:</i></p> <ul style="list-style-type: none"> Describe what meteorology is and what a meteorologist does Distinguish the difference between latitude and longitude. Plot locations on a map using latitude and longitude coordinates Identify the different time zones across the United States Describe the three temperature scales used in Meteorology and also all of Science Decode a station model into general public knowledge Interpret a basic meteogram and infer weather information from the meteogram Isopleth numerical weather data into graphical format Apply meteorological units of temperature, wind, and humidity Describe the processes used to gain new scientific knowledge Apply the steps of the scientific method to a number of everyday questions 	<p>K</p> <p>K</p> <p>K, AP</p> <p>K, AP</p> <p>K</p> <p>K, AP</p> <p>M</p> <p>K, AP</p> <p>AP</p> <p>K</p> <p>AP</p>	<p>Inquiry based Learning Activities</p> <p>Class Discussions</p> <p>Teacher/Student Model Skills</p> <p>Teacher/Student Model Problem Solving</p> <p>Individualized Instruction</p> <p>Group Instruction</p> <p>Videos</p> <p>Teacher Tutoring</p> <p>Interactive Online Learning Modules</p> <p>Homework</p> <p>Content Reviews</p> <p>Worksheets</p> <p>Lab Exercises</p> <p>Online Exploration of Content</p> <p>Simulations</p>	<p>Warm Ups</p> <p>Exit Tickets</p> <p>Quizzes</p> <p>Tests</p> <p>Projects</p> <p>Classwork</p> <p>Homework</p> <p>Online Modules</p> <p>Simulations</p> <p>Lab Exercises</p> <p>Worksheets</p> <p>Observations During Activities</p>	<p>N/A</p>	<p>3.3.10.A3</p> <p>3.3.10.A6</p> <p>3.3.10.A7</p> <p>3.3.10.A8</p> <p>3.3.12.A1</p> <p>3.3.12.A7</p>
Resources/Materials					
<p>Textbook</p> <p>CK-12 Earth Science Flexbook</p> <p>Lab Exercises</p>		<p>Practice & Review Worksheets</p> <p>iPads/Online Modules</p> <p>Isoplething Rule Sheet</p>		<p>Notes</p> <p>Calculators</p>	
Interdisciplinary Relationships & 21st Century Skills					
<p>Geography - plotting locations with latitude and longitude</p> <p>History - history of meteorologists</p> <p>Math - using units of temperature and calculating basic temperature equations</p> <p>Art - isoplething</p> <p>Chemistry - using the scientific method to answer everyday questions</p> <p>Information Technology - computer based data collection and analysis, web searches</p>					

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<p><u>The Global Ledger of Heat Energy</u></p> <p><i>The student will be able to:</i></p> <ul style="list-style-type: none"> • Compare and contrast the three mechanisms of heat transfer • Describe the electromagnetic spectrum and how wavelength and frequency vary across the spectrum • Identify the four layers of the atmosphere • Describe how the amount of solar radiation received at any given point on the Earth varies with latitude • Infer weather information from a skew-T diagram • Explain how convection currents are the driver for all of Earth’s weather 	<p>M</p> <p>K, AP</p> <p>K</p> <p>AP</p> <p>K, AP</p> <p>K</p>	<p>Inquiry based Learning Activities</p> <p>Class Discussions</p> <p>Teacher/Student Model Skills</p> <p>Teacher/Student Model Problem Solving</p> <p>Individualized Instruction</p> <p>Group Instruction</p> <p>Videos</p> <p>Teacher Tutoring</p> <p>Interactive Online Learning Modules</p> <p>Homework</p> <p>Content Reviews</p> <p>Worksheets</p> <p>Lab Exercises</p> <p>Online Exploration of Content</p> <p>Simulations</p>	<p>Warm Ups</p> <p>Exit Tickets</p> <p>Quizzes</p> <p>Tests</p> <p>Projects</p> <p>Classwork</p> <p>Homework</p> <p>Online Modules</p> <p>Simulations</p> <p>Lab Exercises</p> <p>Worksheets</p> <p>Observations During Activities</p>	<p>N/A</p>	<p>3.2.10.B3</p> <p>3.2.10.B5</p> <p>3.2.10.B7</p> <p>3.3.10.A3</p> <p>3.3.10.A6</p> <p>3.3.10.A7</p> <p>3.3.10.A8</p> <p>3.3.12.A1</p> <p>3.3.12.A4</p> <p>3.3.12.A6</p> <p>3.3.12.A7</p>
Resources/Materials					
<p>Textbook</p> <p>CK-12 Earth Science Flexbook</p> <p>Lab Exercises</p>		<p>Practice & Review Worksheets</p> <p>iPads/Online Modules</p>		<p>Notes</p> <p>Calculators</p>	
Interdisciplinary Relationships & 21st Century Skills					
<p>Physics - use of electromagnetic spectrum</p> <p>Chemistry - describing the three mechanisms of heat transfer, describing atmosphere gasses using knowledge from the periodic table.</p> <p>Math - calculating the amount of solar energy any given point on Earth receives</p> <p>Literature - reading articles</p> <p>21st Century Skills - critical thinking, problem solving, creativity, communication & collaboration</p>					

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<p><u>Global and Local Controllers of Weather</u></p> <p><i>The student will be able to:</i></p> <ul style="list-style-type: none"> • Relate the tilt of the Earth’s axis to the changes in the apparent daily path of the Sun during the course of the year • Explain why the tilt of the Earth’s axis leads to seasonal temperature changes on the Earth • Summarize the differences between annual temperature patterns over land versus over water • Make a prediction of what forecasted temperatures may look like for valley locations versus mountain locations on any given day • Differentiate daily maximum and minimum temperatures for elevations vs. urban corridors • Explain the impact rain and snow have on air temperature • Describe the various types of thermometers used to collect temperature data. 	<p>AP</p> <p>K</p> <p>M</p> <p>M</p> <p>K, AP</p> <p>K</p> <p>K</p>	<p>Inquiry based Learning Activities</p> <p>Class Discussions</p> <p>Teacher/Student Model Skills</p> <p>Teacher/Student Model Problem Solving</p> <p>Individualized Instruction</p> <p>Group Instruction</p> <p>Videos</p> <p>Teacher Tutoring</p> <p>Interactive Online Learning Modules</p> <p>Homework</p> <p>Content Reviews</p> <p>Worksheets</p> <p>Lab Exercises</p> <p>Online Exploration of Content</p> <p>Simulations</p>	<p>Warm Ups</p> <p>Exit Tickets</p> <p>Quizzes</p> <p>Tests</p> <p>Projects</p> <p>Classwork</p> <p>Homework</p> <p>Online Modules</p> <p>Simulations</p> <p>Lab Exercises</p> <p>Worksheets</p> <p>Observations During Activities</p>	<p>N/A</p>	<p>3.3.10.A3 3.3.10.A5 3.3.10.A6 3.3.10.A7 3.3.10.A8 3.3.12.A1 3.3.12.A6 3.3.12.A7</p>
Resources/Materials					
<p>Textbook CK-12 Earth Science Flexbook Lab Exercises</p>		<p>Practice & Review Worksheets iPads/Online Modules skew-T Diagram</p>		<p>Notes Calculators</p>	
Interdisciplinary Relationships & 21st Century Skills					
<p>Math - calculating the difference in temperatures History - describing the history of thermometers and other devices used to measure temperature Astronomy - explaining how the Earth rotates on its axis and around the sun Literature - reading meteorology articles 21st Century Skills - critical thinking, problem solving, creativity, communication & collaboration Information Technology - computer based data collection and analysis, web searches</p>					

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<p><u>The Role of Water in Weather</u></p> <p><i>The student will be able to:</i></p> <ul style="list-style-type: none"> Identify and describe all the major parts of the Hydrologic Cycle Explain how a cloud forms Classify cloud types into three distinct categories Observe the different types of clouds in the sky Differentiate between low clouds, middle clouds, and high clouds. Make predictions about future weather patterns based on current cloud observations 	<p>K, AP</p> <p>K</p> <p>AP</p> <p>M</p> <p>K, AP</p> <p>M</p>	<p>Inquiry based Learning Activities</p> <p>Class Discussions</p> <p>Teacher/Student Model Skills</p> <p>Teacher/Student Model Problem Solving</p> <p>Individualized Instruction</p> <p>Group Instruction</p> <p>Videos</p> <p>Teacher Tutoring</p> <p>Interactive Online Learning Modules</p> <p>Homework</p> <p>Content Reviews</p> <p>Worksheets</p> <p>Lab Exercises</p> <p>Online Exploration of Content</p> <p>Simulations</p>	<p>Warm Ups</p> <p>Exit Tickets</p> <p>Quizzes</p> <p>Tests</p> <p>Projects</p> <p>Classwork</p> <p>Homework</p> <p>Online Modules</p> <p>Simulations</p> <p>Lab Exercises</p> <p>Worksheets</p> <p>Observations During Activities</p>	<p>N/A</p>	<p>3.2.12.B5</p> <p>3.3.10.A3</p> <p>3.3.10.A4</p> <p>3.3.10.A5</p> <p>3.3.10.A6</p> <p>3.3.10.A7</p> <p>3.3.10.A8</p> <p>3.3.12.A1</p> <p>3.3.12.A7</p>
Resources/Materials					
<p>Textbook</p> <p>CK-12 Earth Science Flexbook</p> <p>Lab Exercises</p>	<p>Practice & Review Worksheets</p> <p>iPads/Online Modules</p> <p>Cloud Chart</p>		<p>Notes</p> <p>Calculators</p> <p>Cloud Log</p>		
Interdisciplinary Relationships & 21st Century Skills					
<p>Environmental Science - explaining the components of the hydrologic cycle</p> <p>21st Century Skills - critical thinking, problem solving, creativity, communication & collaboration</p> <p>Information Technology - computer based data collection and analysis, web searches</p>					

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<p><u>Surface Patterns of Pressure & Wind</u></p> <p><i>The student will be able to:</i></p> <ul style="list-style-type: none"> ● Explain basic properties of air pressure ● Apply Dalton’s Law to the explanation of standard air pressure ● Apply units of pressure to basic pressure calculations ● Explain how pressure decreases with height in the atmosphere ● Differentiate between high and low pressure systems ● Identify areas of high and low pressure on a weather chart ● Isopleth patterns of surface pressure on weather charts ● Describe the Pressure Gradient Force and Coriolis Force ● Explain how the Pressure Gradient Force and Coriolis Force determine the direction and speed of wind ● Recognize mesoscale patterns of pressure such as sea breezes and land breezes in satellite and radar imagery ● Compare and contrast the properties of sea breezes and land breezes 	<p>K</p> <p>AP</p> <p>AP</p> <p>K</p> <p>M</p> <p>K, AP</p> <p>M</p> <p>K</p> <p>K</p> <p>K, AP</p> <p>M</p>	<p>Inquiry based Learning Activities</p> <p>Class Discussions</p> <p>Teacher/Student Model Skills</p> <p>Teacher/Student Model Problem Solving</p> <p>Individualized Instruction</p> <p>Group Instruction</p> <p>Videos</p> <p>Teacher Tutoring</p> <p>Interactive Online Learning Modules</p> <p>Homework</p> <p>Content Reviews</p> <p>Worksheets</p> <p>Lab Exercises</p> <p>Online Exploration of Content</p> <p>Simulations</p>	<p>Warm Ups</p> <p>Exit Tickets</p> <p>Quizzes</p> <p>Tests</p> <p>Projects</p> <p>Classwork</p> <p>Homework</p> <p>Online Modules</p> <p>Simulations</p> <p>Lab Exercises</p> <p>Worksheets</p> <p>Observations During Activities</p>	<p>N/A</p>	<p>3.2.12.B5</p> <p>3.3.10.A3</p> <p>3.3.10.A4</p> <p>3.3.10.A5</p> <p>3.3.10.A6</p> <p>3.3.10.A7</p> <p>3.3.10.A8</p> <p>3.3.12.A1</p> <p>3.3.12.A7</p>
Resources/Materials					
<p>Textbook</p> <p>CK-12 Earth Science Flexbook</p> <p>Lab Exercises</p>		<p>Practice & Review Worksheets</p> <p>iPads/Online Modules</p>		<p>Notes</p> <p>Calculators</p>	
Interdisciplinary Relationships & 21st Century Skills					
<p>Chemistry - explaining the definition and properties of pressure</p> <p>Math - applying units of pressure to calculations of pressure</p> <p>Art - drawing areas of high and low pressure on a weather map</p> <p>Physics - explaining the concept of Force in the atmosphere</p> <p>21st Century Skills - critical thinking, problem solving, creativity, communication & collaboration</p> <p>Information Technology - computer based data collection and analysis, web searches</p>					

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<p><u>Upper-Air Patterns of Pressure & Wind</u></p> <p><i>The student will be able to:</i></p> <ul style="list-style-type: none"> • Apply knowledge of surface pressure patterns to patterns of pressure in the upper atmosphere • Explain how gravity and the pressure gradient force are balanced in the vertical direction through hydrostatic balance • Identify constant pressure surfaces used in meteorology • Explain how the height of a constant pressure surface depends on temperature • Compare and contrast troughs and ridges of pressure • Identify troughs and ridges on an upper-air pressure chart • Explain how the Pressure Gradient Force and Coriolis Force are balanced through Geostrophic Balance in the horizontal direction • Identify and explain global wind patterns • Predict future weather patterns based on the position of the jet stream in the atmosphere 	<p>M</p> <p>K</p> <p>K</p> <p>K, AP</p> <p>K, AP</p> <p>AP</p> <p>K</p> <p>K</p> <p>M</p>	<p>Inquiry based Learning Activities</p> <p>Class Discussions</p> <p>Teacher/Student Model Skills</p> <p>Teacher/Student Model Problem Solving</p> <p>Individualized Instruction</p> <p>Group Instruction</p> <p>Videos</p> <p>Teacher Tutoring</p> <p>Interactive Online Learning Modules</p> <p>Homework</p> <p>Content Reviews</p> <p>Worksheets</p> <p>Lab Exercises</p> <p>Online Exploration of Content</p> <p>Simulations</p>	<p>Warm Ups</p> <p>Exit Tickets</p> <p>Quizzes</p> <p>Tests</p> <p>Projects</p> <p>Classwork</p> <p>Homework</p> <p>Online Modules</p> <p>Simulations</p> <p>Lab Exercises</p> <p>Worksheets</p> <p>Observations During Activities</p>	<p>N/A</p>	<p>3.3.10.A3</p> <p>3.3.10.A6</p> <p>3.3.10.A7</p> <p>3.3.10.A8</p> <p>3.3.12.A1</p> <p>3.3.12.A7</p>
Resources/Materials					
<p>Textbook</p> <p>CK-12 Earth Science Flexbook</p> <p>Lab Exercises</p>	<p>Practice & Review Worksheets</p> <p>iPads/Online Modules</p>		<p>Notes</p> <p>Calculators</p>		
Interdisciplinary Relationships & 21st Century Skills					
<p>Chemistry - explaining the definition and properties of pressure</p> <p>Math - applying units of pressure to calculations of pressure</p> <p>Art - drawing areas of high and low pressure on a weather map</p> <p>Physics - explaining the concept of Force in the atmosphere</p> <p>21st Century Skills - critical thinking, problem solving, creativity, communication & collaboration</p> <p>Information Technology - computer based data collection and analysis, web searches</p>					

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<p><u>Stability</u></p> <p><i>The student will be able to:</i></p> <ul style="list-style-type: none"> Summarize what relative humidity is and how it is measured Describe devices used to measure relative humidity Explain what the heat index is how it affects the human body Compare and contrast sources of lift in the atmosphere Differentiate between a stable atmosphere and an unstable atmosphere Apply basic chemistry concepts through the Gas Laws to stability in the atmosphere Describe how the principle of buoyancy determines whether a parcel of air rises or sinks in the atmosphere Use a skew-T and knowledge of lapse rates to determine the path of an air parcel in the atmosphere Illustrate what an inversion looks like on a skew-T diagram 	<p>K, AP</p> <p>K</p> <p>K, AP</p> <p>M</p> <p>M</p> <p>AP</p> <p>K</p> <p>AP</p> <p>M</p>	<p>Inquiry based Learning Activities</p> <p>Class Discussions</p> <p>Teacher/Student Model Skills</p> <p>Teacher/Student Model Problem Solving</p> <p>Individualized Instruction</p> <p>Group Instruction</p> <p>Videos</p> <p>Teacher Tutoring</p> <p>Interactive Online Learning Modules</p> <p>Homework</p> <p>Content Reviews</p> <p>Worksheets</p> <p>Lab Exercises</p> <p>Online Exploration of Content</p> <p>Simulations</p>	<p>Warm Ups</p> <p>Exit Tickets</p> <p>Quizzes</p> <p>Tests</p> <p>Projects</p> <p>Classwork</p> <p>Homework</p> <p>Online Modules</p> <p>Simulations</p> <p>Lab Exercises</p> <p>Worksheets</p> <p>Observations During Activities</p>	<p>N/A</p>	<p>3.3.10.A3</p> <p>3.3.10.A6</p> <p>3.3.10.A7</p> <p>3.3.10.A8</p> <p>3.3.12.A1</p> <p>3.3.12.A7</p>
Resources/Materials					
<p>Textbook</p> <p>CK-12 Earth Science Flexbook</p> <p>Lab Exercises</p>		<p>Practice & Review Worksheets</p> <p>iPads/Online Modules</p> <p>Heat Index Chart</p>		<p>Notes</p> <p>Calculators</p> <p>skew-T Diagram</p>	
Interdisciplinary Relationships & 21st Century Skills					
<p>Math - calculating the amount of relative humidity in the air</p> <p>Chemistry - applying basic Gas Laws concepts to stability in the atmosphere</p> <p>History - explaining devices used to measure relative humidity over the past 100 years</p> <p>Physics - explaining the principle of buoyancy in a fluid (air)</p> <p>21st Century Skills - critical thinking, problem solving, creativity, communication & collaboration</p> <p>Information Technology - computer based data collection and analysis, web searches</p>					

Catasauqua Area School District

Course Title: Meteorology

Grade Level: 9th through 12th

Objectives	Level of Ach.	Suggested Learning Activities	Forms of Assessment	Assess. Anchor	PA Stand.
<p><u>Thunderstorms</u></p> <p><i>The student will be able to:</i></p> <ul style="list-style-type: none"> ● Identify common misconceptions with how POP is perceived by the public audience ● Summarize how thunderstorms form ● Categorize thunderstorms into two categories: air mass thunderstorms and frontal thunderstorms (organized convection) ● Describe the three stages of the thunderstorm life cycle ● Explain how lightning forms and how thunder results from lightning ● Identify the characteristics of a severe thunderstorm ● Recognize the differences between an air mass thunderstorm and a supercell thunderstorm ● Identify a supercell thunderstorm on radar imagery ● Explain how bow echoes form from squall lines of thunderstorms ● Identify squall lines and bow echoes on satellite and radar imagery ● Predict future weather conditions based on the movement of squall line, supercellular, and bow echo thunderstorm complexes 	<p>K</p> <p>K, AP AP</p> <p>K, AP</p> <p>K</p> <p>K</p> <p>K</p> <p>M</p> <p>K</p> <p>K, AP</p> <p>M</p>	<p>Inquiry based Learning Activities</p> <p>Class Discussions</p> <p>Teacher/Student Model Skills</p> <p>Teacher/Student Model Problem Solving</p> <p>Individualized Instruction</p> <p>Group Instruction</p> <p>Videos</p> <p>Teacher Tutoring</p> <p>Interactive Online Learning Modules</p> <p>Homework</p> <p>Content Reviews</p> <p>Worksheets</p> <p>Lab Exercises</p> <p>Online Exploration of Content</p> <p>Simulations</p>	<p>Warm Ups</p> <p>Exit Tickets</p> <p>Quizzes</p> <p>Tests</p> <p>Projects</p> <p>Classwork</p> <p>Homework</p> <p>Online Modules</p> <p>Simulations</p> <p>Lab Exercises</p> <p>Worksheets</p> <p>Observations During Activities</p>	<p>N/A</p>	<p>3.2.12.B5 3.3.10.A3 3.3.10.A4 3.3.10.A6 3.3.10.A7 3.3.10.A8 3.3.12.A1 3.3.12.A7</p>
Resources/Materials					
<p>Textbook CK-12 Earth Science Flexbook Lab Exercises</p>	<p>Practice & Review Worksheets iPads/Online Modules</p>		<p>Notes Calculators</p>		
Interdisciplinary Relationships & 21st Century Skills					
<p>Physics - explaining the topic of electricity to explain how lightning forms History - explaining the history of weather radar 21st Century Skills - critical thinking, problem solving, creativity, communication & collaboration Information Technology - computer based data collection and analysis, web searches</p>					

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Objectives	Level of Ach.	Suggested Learning Activities	Forms of Assessment	Assess. Anchor	PA Stand.
<p><u>Mid-Latitude Cyclone Model</u></p> <p><i>The student will be able to:</i></p> <ul style="list-style-type: none"> Describe the characteristics of Continental and Maritime air masses - Polar, Arctic, and Tropical. Identify weather fronts on a surface analysis map Draw frontal zones on a blank weather map based on weather observations Explain the differences between warm fronts, cold fronts, occluded fronts, and stationary fronts. Predict future weather patterns based on the movement of air masses and associated frontal patterns Label the key components of a mid-latitude cyclone Describe the life cycle of a mid-latitude cyclone Identify jet streams on an upper-air analysis map. 	<p>K</p> <p>K, AP</p> <p>M</p> <p>K</p> <p>M</p> <p>AP</p> <p>K, AP</p> <p>K, AP</p>	<p>Inquiry based Learning Activities</p> <p>Class Discussions</p> <p>Teacher/Student Model Skills</p> <p>Teacher/Student Model Problem Solving</p> <p>Individualized Instruction</p> <p>Group Instruction</p> <p>Videos</p> <p>Teacher Tutoring</p> <p>Interactive Online Learning Modules</p> <p>Homework</p> <p>Content Reviews</p> <p>Worksheets</p> <p>Lab Exercises</p> <p>Online Exploration of Content</p> <p>Simulations</p>	<p>Warm Ups</p> <p>Exit Tickets</p> <p>Quizzes</p> <p>Tests</p> <p>Projects</p> <p>Classwork</p> <p>Homework</p> <p>Online Modules</p> <p>Simulations</p> <p>Lab Exercises</p> <p>Worksheets</p> <p>Observations During Activities</p>	<p>N/A</p>	<p>3.2.12.B5</p> <p>3.3.10.A3</p> <p>3.3.10.A4</p> <p>3.3.10.A6</p> <p>3.3.10.A7</p> <p>3.3.10.A8</p> <p>3.3.12.A1</p> <p>3.3.12.A7</p>
Resources/Materials					
<p>Textbook</p> <p>CK-12 Earth Science Flexbook</p> <p>Lab Exercises</p>		<p>Practice & Review Worksheets</p> <p>iPads/Online Modules</p>		<p>Notes</p> <p>Calculators</p>	
Interdisciplinary Relationships & 21st Century Skills					
<p>Art - students will draw fronts on a weather surface map</p> <p>21st Century Skills - critical thinking, problem solving, creativity, communication & collaboration</p> <p>Information Technology - computer based data collection and analysis, web searches</p>					

Catasauqua Area School District

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Grade Level: 9th through 12th

Objectives	Level of Ach.	Suggested Learning Activities	Forms of Assessment	Assess. Anchor	PA Stand.
<p><u>Severe Weather/Tornadoes</u></p> <p><i>The student will be able to:</i></p> <ul style="list-style-type: none"> Define what a downburst/microburst is Create a sketch of a downburst as it impacts the ground from a parent thunderstorm Describe how downbursts/microbursts form Compare and contrast dry microbursts with wet microbursts Describe the ways in which tornadoes form Explain the three stages of the life-cycle of a tornado Summarize the Enhanced Fujita Scale Rank tornado damage on the Enhanced Fujita Scale based on visual observations of the damage Compare and contrast tornadoes from dust devils and waterspouts Select the best way to stay safe during a tornado warning given multiple real life scenarios 	<p>K</p> <p>AP</p> <p>K</p> <p>AP</p> <p>K</p> <p>K, AP</p> <p>M</p> <p>AP</p> <p>K, AP</p> <p>K, AP</p>	<p>Inquiry based Learning Activities</p> <p>Class Discussions</p> <p>Teacher/Student Model Skills</p> <p>Teacher/Student Model Problem Solving</p> <p>Individualized Instruction</p> <p>Group Instruction</p> <p>Videos</p> <p>Teacher Tutoring</p> <p>Interactive Online Learning Modules</p> <p>Homework</p> <p>Content Reviews</p> <p>Worksheets</p> <p>Lab Exercises</p> <p>Online Exploration of Content</p> <p>Simulations</p>	<p>Warm Ups</p> <p>Exit Tickets</p> <p>Quizzes</p> <p>Tests</p> <p>Projects</p> <p>Classwork</p> <p>Homework</p> <p>Online Modules</p> <p>Simulations</p> <p>Lab Exercises</p> <p>Worksheets</p> <p>Observations During Activities</p>	<p>N/A</p>	<p>3.2.12.B5</p> <p>3.3.10.A3</p> <p>3.3.10.A4</p> <p>3.3.10.A6</p> <p>3.3.10.A7</p> <p>3.3.10.A8</p> <p>3.3.12.A1</p> <p>3.3.12.A7</p>

Resources/Materials

<p>Textbook</p> <p>CK-12 Earth Science Flexbook</p> <p>Lab Exercises</p>	<p>Practice & Review Worksheets</p> <p>iPads/Online Modules</p> <p>Enhanced Fujita Tornado Scale Handout</p>	<p>Notes</p> <p>Calculators</p>
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Interdisciplinary Relationships & 21st Century Skills

<p>Physics - students will receive a review on gravity and force</p> <p>History - review over historical severe weather and tornado events in the United States</p> <p>Geography - plotting tornado damage paths across the United States</p> <p>21st Century Skills - critical thinking, problem solving, creativity, communication & collaboration</p> <p>Information Technology - computer based data collection and analysis, web searches</p>
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Catasauqua Area School District

Course Title: Meteorology

Grade Level: 9th through 12th

Objectives	Level of Ach.	Suggested Learning Activities	Forms of Assessment	Assess. Anchor	PA Stand.
<p><u>Tropical Weather</u></p> <p><i>The student will be able to:</i></p> <ul style="list-style-type: none"> Differentiate characteristics between a tropical depression, tropical storm, and a hurricane. Classify hurricanes in order of wind speed on the Saffir-Simpson Scale Explain how hurricanes form from clusters of thunderstorms Describe the different names hurricanes are given throughout the world. Plot the path of a hurricane in the Atlantic using real hurricane observation data. Identify the eyewall structure of a hurricane on radar and satellite imagery Describe the effects of hurricanes on coastlines and property. Explain how hurricanes get their energy from warm ocean water. 	<p>K, AP</p> <p>K</p> <p>K, AP</p> <p>K</p> <p>M</p> <p>K, AP</p> <p>K</p> <p>K</p>	<p>Inquiry based Learning Activities</p> <p>Class Discussions</p> <p>Teacher/Student Model Skills</p> <p>Teacher/Student Model Problem Solving</p> <p>Individualized Instruction</p> <p>Group Instruction</p> <p>Videos</p> <p>Teacher Tutoring</p> <p>Interactive Online Learning Modules</p> <p>Homework</p> <p>Content Reviews</p> <p>Worksheets</p> <p>Lab Exercises</p> <p>Online Exploration of Content</p> <p>Simulations</p>	<p>Warm Ups</p> <p>Exit Tickets</p> <p>Quizzes</p> <p>Tests</p> <p>Projects</p> <p>Classwork</p> <p>Homework</p> <p>Online Modules</p> <p>Simulations</p> <p>Lab Exercises</p> <p>Worksheets</p> <p>Observations During Activities</p>	<p>N/A</p>	<p>3.2.12.B5 3.3.10.A3 3.3.10.A4 3.3.10.A5 3.3.10.A6 3.3.10.A7 3.3.10.A8 3.3.12.A1 3.3.12.A7</p>
Resources/Materials					
<p>Textbook</p> <p>CK-12 Earth Science Flexbook</p> <p>Lab Exercises</p>		<p>Practice & Review Worksheets</p> <p>iPads/Online Modules</p> <p>Saffir-Simpson Scale Handout</p>		<p>Notes</p> <p>Calculators</p>	
Interdisciplinary Relationships & 21st Century Skills					
<p>Geography - plotting the paths of hurricanes in the Atlantic and Pacific Oceans</p> <p>Math - calculating the wind speed of hurricanes</p> <p>History - reviewing over significant hurricane landfalls in the United States over the past 100 years</p> <p>Physics - reviewing over force on objects such as houses in a hurricane</p> <p>21st Century Skills - critical thinking, problem solving, creativity, communication & collaboration</p> <p>Information Technology - computer based data collection and analysis, web searches</p>					

Catasauqua Area School District

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Objectives	Level of Ach.	Suggested Learning Activities	Forms of Assessment	Assess. Anchor	PA Stand.
<p><u>Winter Weather</u></p> <p><i>The student will be able to:</i></p> <ul style="list-style-type: none"> List and explain the ingredients needed to create a winter storm. Differentiate between synoptic-scale and mesoscale snowstorms Isopleth snowfall reports on a blank weather map Explain how Nor'Easters form and why they get their name List the criteria needed to classify a snowstorm as a blizzard Identify and describe the four types of precipitation associated with winter storms Summarize how each type of winter precipitation forms in a winter storm Make a prediction for precipitation type in a winter storm based on air temperature Explain how ice storms occur Describe how lake effect snow occurs and differentiate long fetch lake effect snow from short fetch lake effect snow. 	<p>K, AP</p> <p>K, AP</p> <p>M</p> <p>K</p> <p>K, AP</p> <p>K</p> <p>M</p> <p>M</p> <p>K</p> <p>K, AP</p>	<p>Inquiry based Learning Activities</p> <p>Class Discussions</p> <p>Teacher/Student Model Skills</p> <p>Teacher/Student Model Problem Solving</p> <p>Individualized Instruction</p> <p>Group Instruction</p> <p>Videos</p> <p>Teacher Tutoring</p> <p>Interactive Online Learning Modules</p> <p>Homework</p> <p>Content Reviews</p> <p>Worksheets</p> <p>Lab Exercises</p> <p>Online Exploration of Content</p> <p>Simulations</p>	<p>Warm Ups</p> <p>Exit Tickets</p> <p>Quizzes</p> <p>Tests</p> <p>Projects</p> <p>Classwork</p> <p>Homework</p> <p>Online Modules</p> <p>Simulations</p> <p>Lab Exercises</p> <p>Worksheets</p> <p>Observations During Activities</p>	<p>N/A</p>	<p>3.2.12.B5</p> <p>3.3.10.A3</p> <p>3.3.10.A6</p> <p>3.3.10.A7</p> <p>3.3.10.A8</p> <p>3.3.12.A1</p> <p>3.3.12.A7</p>
Resources/Materials					
<p>Textbook</p> <p>CK-12 Earth Science Flexbook</p> <p>Lab Exercises</p>	<p>Practice & Review Worksheets</p> <p>iPads/Online Modules</p>		<p>Notes</p> <p>Calculators</p>		
Interdisciplinary Relationships & 21st Century Skills					
<p>Geography - researching areas where major blizzards typically occur</p> <p>History - reviewing over blizzard data in the United States over the past 100 years</p> <p>Chemistry - reviewing over basic phase changes and phase change diagrams</p> <p>21st Century Skills - critical thinking, problem solving, creativity, communication & collaboration</p> <p>Information Technology - computer based data collection and analysis, web searches</p>					