# Climate!

# It's All in the Data

## Science Grade 3

This unit is designed to have the students explore the different climate regions of the world. The students will examine the characteristics of the regions. The students will learn the difference between climate and weather. Not only will the students learn about climate and weather, they will also learn how weather and climate data can be analyzed to help predict future conditions. The students will determine the causes and effects of a natural disaster. They will learn what they can do to prepare for natural disasters.

**Please provide us some background information on the unit development.** In order to help others who are interested in this topic understand a bit more about what you created, we will write a short introduction to each unit and provide some images, in addition to posting the completed units on the Cape Cod Regional STEM Network website ([www.capecodstemnetwork.org](www.capecodstemnetwork.org)). Please help us by answering the questions below after you have completed your unit.

**1.** Who helped to create this unit?

| Names | School (Grade/course taught) |
|---|---|
| Michael Irving | 3rd Grade - North Falmouth Elementary School |
| Grace Simpkins | Marine Education Specialist, Woods Hole Sea Grant (WHOI) |

2. What were some sources of inspiration for this unit?

Our main inspiration for this unit is the ongoing Covid-19 Global Pandemic. We felt it was important to create lessons for both in-class and remote learning. These lessons include hands-on and outdoor activities for students who may be working from home. The other sources of inspiration for this unit are how important it is for students to understand that our local weather patterns and climate are not the same as other geographic locations. Our area is prone to hurricanes but other areas may be more prone to other weather phenomena such as tornadoes or excessive precipitation. What makes each area unique and how does analyzing patterns in weather and climate help us form prediction models and be prepared when disaster strikes? Our scientific community on Cape Cod has a wide range of tools to gather and analyze data both on land and at sea. The scientific community is so eager to share their findings with us.

3. In your own words, what are you hoping students learn—big picture—through this unit?

I hope the students understand how much our everyday lives are affected by climate and weather. Our ecosystem, environment and economy all depend on studying and learning about our climate.

4. What might students find exciting in this unit?

Extreme weather can be very exciting. How storms form, why they form in certain areas and not others, and how we prepare for them can be exciting and empowering to students as they educate their families. In this unit, we have tried to tie into several of theNOAA Live! Webinars that allow the students to hear from real scientists across the country that either research these extreme weather events or help predict and warn

communities the storms are coming.  The students may be surprised to know that the National Weather Service is part of NOAA and has offices as close as Taunton..

5.  What science standards or real-world content did you strive to emphasize?

Climate and weather data can be recorded and analyzed everyday.  Students are used to observing the weather by stepping outside or looking out their window but the concept of climate can be harder for them to grasp.  This unit will focus mostly on physical science but definitely ties in with life science as well.

6.  How would you say that this unit "matters" to the STEM community?  Or to our community on Cape Cod?  Or to the larger community?

This unit is what STEM is all about.  All four aspects of STEM are used for learning about climate and analyzing data.  Cape Cod has a unique climate and a wide range of possible weather types.  This unit will show students that they can and will use science, technology, engineering and math to complete these lessons.

7.  What's the most important lesson you learned as you created this?

The amazing amount of data and resources that come out of NOAA.  It is easy to access for all age groups.

8.  Anything else you would like fellow teachers or others to know about this unit?

# Table of Contents

## Stage 1 Desired Results

**MA STE Standards:**

3-ESS2-2. Obtain and summarize information about the climate of different regions of the world to illustrate that typical weather conditions over a year vary by region.
Clarification Statement:
• Examples of information can include climate data (average temperature, average precipitation, average wind speed) or comparative descriptions of seasonal weather for different regions.

**Next Generation Science Standards:**

3-ESS2-1 Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

3-ESS2-2 Obtain and combine information to describe climates in different regions of the world.

**Ocean Literacy Principles:**

3 - The ocean is a major influence on weather and climate.
• a. The ocean interaction of oceanic and atmospheric processes controls weather and climate by dominating the Earth's energy, water and carbon systems.
• b. The ocean moderates global weather and climate by absorbing most of the solar radiation

**ESSENTIAL QUESTIONS:**
**What does the word climate mean?**
**WHat are examples of weather?**
**How does climate differ from weather?**
**Are climate and weather predictable?**

**UNDERSTANDINGS:**
**Students will understand that the climate and weather are different.**
**Students will understand that weather changes over short periods of time.**
**Students will understand that climate takes longer periods of time to change.**
**Students will understand that areas of the world have different climates.**

**Students will be skilled at reading weather data.**
**Students will be skilled at using data to predict the weather.**

**TRANSFER:**
**Students will be able to independently use their understanding of weather to observe the weather.**
**Students will use data to make educated decisions**

reaching Earth. Heat exchange between the ocean and atmosphere drives the water cycle and oceanic and atmospheric circulation

• c. Heat exchange between the ocean and atmosphere can result in dramatic global and regional water phenomena, impacting patterns of rain and drought. Significant examples include the El Niño Southern Oscillation and La Niña, which causes important changes in global weather patterns because they alter the sea surface temperature patterns in the Pacific.

• d. Condensation of water that evaporated from warm seas provides the energy for hurricanes and cyclones. Most rain that falls on land originally evaporated from the tropical ocean.

**Cross-Curricular Connections:**

CCSS.ELA-LITERACY.RL.3.1

Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

CCSS.ELA-LITERACY.RI.3.3

Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

CCSS.ELA-LITERACY.RI.3.4

Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a *grade 3 topic or subject area*.

CCSS.ELA-LITERACY.RI.3.5

Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.

CCSS.ELA-LITERACY.RI.3.7

Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).

CCSS.ELA-LITERACY.W.3.7

Conduct short research projects that build knowledge about a topic.

## Stage 2 Evidence

**Formative Assessment Ideas:**
Give examples of weather and climate
Completion of daily assignments
Daily teacher observations

**Summative Assessment Ideas:**
Projects
Hands-on activities
Teacher observations

## Stage 3 Learning Plan

**Summary of Key Learning Events and Instruction**

**Lesson 1: Climate Around the World** - We will explore weather and weather patterns around the world.

**Lesson 2: Analyzing Weather Data** - The students will look at weather data from our region and other specific regions.

**Lesson 3: A Recipe for Natural Disasters** - The students will explore natural disasters and their relationship to climate.

**Lesson 4: Our Climate on Cape Cod** - What is Cape Cod's climate.  How does Cape Cod's climate affect our weather and every day lives?

| Introductory Lesson | Constructing Lesson | Practice Lesson | Assessment Lesson |
|---|---|---|---|
| Lesson that introduces the content.  More teacher directed | Lessons that engage students in building and linking together understanding.  Guided/collaborative.  Student/teacher or partners/small group | Lessons or activities that students can complete relatively independently | Formative: Check-ins along the way to see if students "get it" <br> Summative: Students showing what they know, when you feel they are ready |

## Stage 3 Learning Plan

**Summary of Key Learning Events and Instruction**

| Lesson Name | Type (Introductory, Constructing, Practice, and Assessment) | Content Addressed | Standards Included (by number) |
|---|---|---|---|
| 1.  Climate Around the World | Introductory, Constructing, Practice | What is climate? Climates of given areas. Climate changes over long periods of time.. | 3-ESS2-2. |
| 2.  Analyzing Weather Data | Constructing, Practice | Analyzing weather data from a region helps predict the weather. | 3-ESS2-2. |
| 3.  A Recipe for Natural Disaster | Constructing, Practice | Natural disasters (hurricanes, tornadoes, thunderstorms, blizzards).  How does the climate of an area increase or decrease the likelihood of a natural disaster?  Preparing for natural disasters. | 3-ESS2-2. |

| 4. Our Local Climate | Practice, Assessment | What type of climate do we have on Cape Cod? We will look at data from previous years to predict the weather for the future. | 3-ESS2-2. |
|---|---|---|---|

# Lesson 1: Climate Around the World

| |
|---|
| **Overview of the Lesson:** The students will examine the climate and weather from around the world.  The students will analyze certain regions of the world to determine how climate impacts the region.<br><br>**Time (minutes): (45-60 minutes)** |
| **Standard(s):**<br>MA STE Standard : 3-ESS2-2<br>Next Generation Science Standard: 3-ESS2-1 and 3-ESS2-2<br>Ocean Literacy Principles: 3, a-d<br><br> |
| **Essential Question(s):**<br>    ● What does the word climate mean?<br>    ● What are examples of weather?<br>    ● How does climate differ from weather?<br>    ● What instruments do we use to collect weather data?<br><br> |
| **Science Objectives:**<br>    ● Students will understand what climate means.<br>    ● Students will learn the difference between climate and weather.<br>    ● Students will learn about different regions of the world. |

- Students will understand the impact the sun has on a region's climate.
- Students will understand how weather data is gathered.

**Language Objectives and/or Targeted Academic Language:**

| | | | |
|---|---|---|---|
| **climate** | **region** | **weather** | **temperature** |
| **thermometer** | **equator** | **average** | **temperate** |
| **tropical** | | | |

**Anticipated Student Preconceptions/Misconceptions (optional)**
- The students may think that weather and climate are the same thing.

**Instructional Materials/Resources/Tools**
SmartBoard/Chart paper
Colored pencils
Computer/Internet
Climate Zone Map and Answer Key
Physical or Google Maps

**Assessment:**
The students will hand in their completed assignments
Teacher observation

**Instructional Tips/Strategies/Suggestions for Teacher:**  These lessons were developed to utilize the 39 NOAA Live! Recorded Webinar Videos. While certain video clips were pulled out to highlight concepts, you may want to look at the whole playlist on YouTube to see the additional resources available.  If your class has a particular interest, you may find a more relevant webinar to highlight in the video section of the lesson.   If your students are not familiar with using the scroll bar at the bottom of a YouTube video to move to a specific timestamp you may want to review or practice with them first.

**Science and Engineering Practices included (put the included ones in bold):**
1. **Asking questions (for science) and defining problems (for engineering)**
2. **Developing and using models**
3. **Planning and carrying out investigations**
4. **Analyzing and interpreting data**
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. **Obtaining, evaluating, and communicating information**

**Notes about Science and Engineering Practices included:** Note we will be discussing macroclimates not microclimates. Some students may mention other more specific regions. Explain to the students we are speaking in general terms.

**Lesson Overview:** The students will learn what the term climate means.  The students will use maps to observe regions of the world to determine what their climate is.  We will observe a demonstration of the sun's impact on the Earth's weather and climate.

| IN CLASS | VIRTUAL ALTERNATIVE |
|---|---|
| **Opening/Engagement: (5-10 minutes)** | **Independent Assignment: (15-20 minutes)** |
| 1. Ask the question, What is the weather today?  Observe the weather.  What is the estimated temperature?  Is there any precipitation?  What do you think the weather will be like later today? Tomorrow? | 1. Before the students meet with the teacher, have the students watch a grade appropriate video or two on comparing weather and climate: Example: https://www.youtube.com/watch?v=_fANLICuYB8 |
| 2. Write the word climate on the SmartBoard or Chart Paper. Ask the question, "What does the word climate mean?" Possible answers may include the same as weather, temperature, the weather in a region, etc. Write all the answers on the SmartBoard or chart paper. When the students run out of answers, go through the choices and circle the correct answers. | 2. In Google Classroom, have the students complete a short assignment on a Google Doc:

Weather is _____?
Climate is _____? |
| 3. Have the students turn and talk to answer the following question. What is the difference between climate and weather? The answer you are looking for is: weather is atmospheric changes from day to | List 5 examples of weather conditions: |

| | |
|---|---|
| day in a given area and climate describes weather in a given area over long periods of time. | Describe three climate zones: |

| IN CLASS | |
|---|---|
| **During the Lesson: (15-20 minutes)**<br>1. When we think about climate, what factor has the greatest impact on the climate of a region? The students should understand that the sun has the biggest impact on a region's climate. The answer you are looking for is the sun. (Teacher note: Land formations, prevailing winds, and ocean currents affect it as well and may be mentioned but we are focussing on the sun).<br>2. Project a physical map of the Earth on the SmartBoard or show a globe. Ask the students to observe the different colors on the map. Ask the students if they can point out the arctic, mountain, desert and tropical regions. *Teacher note: The Earth has a fixed tilt and it orbits around the sun. Due to the tilt and the Earth's relationship to the sun, the northern hemisphere is receiving more direct sunlight in the summer. The opposite is true in the winter which leads to our seasons. Students will cover this in 5th grade but you can give the general details if students ask or the discussion goes in that direction.<br>3. Show that the intensity of the sun on parts of the globe throughout the year. Ask what areas are impacted by the sun the most? Choose 3 locations on the earth 1. close to where you live 2. on the other side of the globe 3. in the Southern Hemisphere. Have the students predict how the sun will affect the weather in those 3 locations. Have the students direct you on how to correctly point the flashlight at the globe.<br>4. Project a physical map of the Earth or Google Map on a screen. Ask the students to quickly recall the 6 climate regions found on earth. The students should come up with near the ocean, mountains, deserts, temperate forests, arctic, and tropical rainforests. | **Meet with the Teacher (Zoom): (15-20 minutes)**<br>1. What is the weather today? Observe the weather. What is the estimated temperature? Is there any precipitation? What do you think it will be like later today? Tomorrow?<br>2. Write the word climate on your screen. Ask the question, "What does the word climate mean?" Possible answers may include weather, temperature, the weather in a region, etc. Write all the answers on the board or paper. When the students run out of answers, go through the choices and circle the correct answers.<br>3. Have the students think about the following question. What is the difference between climate and weather? The answer you are looking for is: weather is atmospheric changes from day to day in a given area and climate describes weather in a given area over long periods of time.<br>4. When we think about climate, what factor has the greatest impact on the climate of a region? The students should understand that the sun has the biggest impact on a region's climate. The answer you are looking for is the sun. (Teacher note: Land formations, prevailing winds, and ocean currents affect it as well and may be mentioned but we are focussing on the sun).<br>5. Project a physical map of the Earth on your screen or show a globe. Ask the students to observe the different colors on the map. Ask the students if they can point out the arctic, mountain, desert and tropical regions.<br>6. Project a physical map of the Earth on your screen or show a globe. Ask the students to observe the different colors on the map. Ask the students if they can point out the arctic, mountain, desert and tropical regions. *Teacher note: The Earth has a fixed tilt and it orbits around the sun. Due to the tilt and the Earth's relationship to |

<table>
<tr>
<td></td>
<td>

the sun, the northern hemisphere is receiving more direct sunlight in the summer.  The opposite is true in the winter which leads to our seasons.   Students will cover this in 5th grade but you can give the general details if students ask or the discussion goes in that direction.

7. Show that the intensity of the sun on parts of the globe throughout the year. Ask what areas are impacted by the sun the most? Choose 3 locations on the earth 1. close to where you live 2. on the other side of the globe 3. in the Southern Hemisphere.  Have the students predict how the sun will affect the weather in those 3 locations. Have the students direct you on how to correctly point the flashlight at the globe.

8. Project a physical map or Google Map on a screen. Ask the students to quickly recall the 6 climate regions found on earth.  The students should come up with near the ocean, mountains, deserts, temperate forests, arctic, and tropical rainforests.

</td>
</tr>
<tr>
<td></td>
<td>

VIRTUAL ACTIVITY

**Activity: Climate Zones of the World Map - Have the students label the zones before letting the color.  You may have to model a few of the more difficult sections (Australia, South America) Using the information you have learned in this lesson color the map using the following legend:**

> **Cold - Blue**
> **Temperate - Brown**
> **Warm – Orange**
> **Tropical - Green**

**When you finish coloring the map, label the region with a picture of a full sun, ½ sun or little sun depending on how much sun the region gets.**

</td>
</tr>
<tr>
<td>

**IN CLASS**

</td>
<td>

VIRTUAL ALTERNATIVE

</td>
</tr>
<tr>
<td>

**Lesson Closing: (20 minutes)**

</td>
<td>

**Lesson Closing (Zoom): (10 minutes)**

</td>
</tr>
</table>

| | |
|---|---|
| **Activity:** [Climate Zones of the World Map](#) - **Have the students label the zones before letting the color. You may have to model a few of the more difficult sections (Australia, South America) Using the information you have learned in this lesson color the map using the following legend:**<br>    **Cold - Blue**<br>    **Temperate - Brown**<br>    **Warm – Orange**<br>    **Tropical - Green**<br>**When you finish coloring the map, label the region with a picture of a full sun, ½ sun or little sun depending on how much sun the region gets.**<br><br>**Completed Map:**<br>[https://layers-of-learning.com/wp-content/uploads/2019/05/climate.png](https://layers-of-learning.com/wp-content/uploads/2019/05/climate.png) | 1. Check in with your students<br>2. Review the difference between weather and climate<br>3. Have the students show their maps. Project a completed map on your screen. Completed Map:<br>[https://layers-of-learning.com/wp-content/uploads/2019/05/climate.png](https://layers-of-learning.com/wp-content/uploads/2019/05/climate.png) |
| | **EXPLORE OUTDOORS:**<br>Go outside and observe the weather. Is the weather for the day appropriate for the season? Example: Is it raining in January instead of snowing? Is there a heat wave (3 consecutive days over 90 degrees)? Are there any other patterns? Example: No rain for a week. |

# Lesson 2: Analyzing Weather Data

**Overview of the Lesson:** In this lesson the students will learn how important data is to predicting weather and observing climate change.  Data is also used to see changes in climate in a given region over time.  They will explore how to collect and use that data to help determine the cause of climate changes.  The students will use data to predict the weather in a given region.

**Time (minutes): (45-60 minutes)**

**Standard(s):**

MA STE Standard : 3-ESS2-2

Next Generation Science Standard: 3-ESS2-1 and 3-ESS2-2

Ocean Literacy Principles: 3, a-d

**Essential Question(s):**
- How do scientists gather data on climate and weather?
- What tools do scientists use to gather data?
- Why is data useful in predicting the weather?
- What patterns can you use for predicting weather and storms?

**Science Objectives:**
- Students will be able to analyze climate and weather data.
- Students will be able to explain what tools are used to gather data.
- Students will be able to research and record weather data for a particular area.

| |
|---|

**Language Objectives and/or Targeted Academic Language:**

          **data**                           **graphs**                       **temperature**                  **precipitation**

---

**Anticipated Student Preconceptions/Misconceptions (optional):**

---

**Instructional Materials/Resources/Tools:**
SmartBoard/Chart paper
Computer/Internet

---

**Assessment:**
Students will correctly find and use data from different sources..
Students will be able to correctly identify tools used for data gathering.
Teacher observations

---

**Instructional Tips/Strategies/Suggestions for Teacher:**  These lessons were developed to utilize the 39 NOAA Live! Recorded Webinar Videos. While certain video clips were pulled out to highlight concepts, you may want to look at the whole playlist on YouTube to see the additional resources available.  If your class has a particular interest, you may find a more relevant webinar to highlight in the video section of the lesson.

---

**Science and Engineering Practices included (put the included ones in bold):**
1. **Asking questions (for science) and defining problems (for engineering)**
2. **Developing and using models**
3. **Planning and carrying out investigations**
4. **Analyzing and interpreting data**
5. **Using mathematics and computational thinking**
6. Constructing explanations (for science) and designing solutions (for engineering)

7. Engaging in argument from evidence
8. **Obtaining, evaluating, and communicating information**

**Notes about Science and Engineering Practices included:**

**Lesson Overview:** In this lesson the students will learn how important data is to predicting weather and observing climate change.  Data is also used to see changes in climate in a given region over time.  They will use that data to help determine the cause of the climate changes  The students will use data to predict the weather in a given region.

| IN CLASS | VIRTUAL ALTERNATIVE |
|---|---|
| **Opening/Engagement: (10-15 minutes)**<br>1. Ask the students to tell you what the cafeteria is serving for lunch today.  Once you have the correct answer, ask them how they know. Answers will include: the lunch menu, we have pizza every Friday, Wednesday is pasta day, etc. Tell them they are using prior knowledge and data to make logical predictions.<br>2. Ask them, What is the weather going to be like tomorrow?  What will the weather be like 6 months from now? We don't know exactly, but if we have data we can make a logical prediction.<br>3. On a SmartBoard or chart paper write the words weather data then ask the questions, "What weather data do you think is important to collect?" and "How do you think weather data is collected?" Lead the students if you don't get the answers temperature, wind, precipitation (rain or snow) and thermometers, rain gauges and anemometers (bonus for that one).  You can even discuss the placement of your tools to best collect your data.<br>4. Use NOAA Live! webinar clips to show some unique ways we collect weather or ocean data:<br>NOAA Live! Webinar 7: Saildrone: Sailing the Seas for Science, 15:53-18:48 (how they launch and drive the drone) saildrone (picture) | **Independent Assignment: (10-15 minutes)**<br>1. Before the students meet with the teacher, have the students watch 2 of the NOAA Live! video clips that show unique ways we collect weather or ocean data::<br>NOAA Live! Webinar 7: Saildrone: Sailing the Seas for Science, 15:53-18:48 (how they launch and drive the drone) saildrone (picture)<br> NOAA Live! Webinar 24: Talking Tornadoes with a Storm Researcher!, 40:26-43:55 (the vehicle they use to measure temperature, wind speed, etc.  - mobile mesonet), 43:56-46:26 (how the weather service uses weather balloons to measure conditions in the air)<br>NOAA Live! Webinar 8: Hunting Hurricanes with a NOAA Pilot, - 30:16-31:51 (airplanes) - 51:46-53:23 (using airplanes to gather data for hurricane warnings and forecasts)<br>NOAA Live! Webinar  19: Getting Prepared for Hurricane Season, 16:03-17:04 (dropping drones into hurricanes), 33:14-35:26 (how do we predict the weather and track hurricanes)<br><br>2. In Google Classroom, have the students complete a short assignment on a Google Doc: |

| | |
|---|---|
| [NOAA Live! Webinar 24](#): Talking Tornadoes with a Storm Researcher!, 40:26-43:55 (the vehicle they use to measure temperature, wind speed, etc. - mobile mesonet), 43:56-46:26 (how the weather service uses weather balloons to measure conditions in the air)<br><br>[NOAA Live! Webinar 8](#): Hunting Hurricanes with a NOAA Pilot, - 30:16-31:51 (airplanes) - 51:46-53:23 (using airplanes to gather data for hurricane warnings and forecasts)<br><br>[NOAA Live! Webinar  19](#): Getting Prepared for Hurricane Season, 16:03-17:04 (dropping drones into hurricanes), 33:14-35:26 (how do we predict the weather and track hurricanes)<br><br>**Follow up activity - Challenge the students to invent a unique way to gather data during a storm.  Have them draw and label their design. No idea is too crazy!** | How do scientists collect data?  What are some of the tools they use? What data do scientists collect?<br>Why do scientists collect data? (How do they use this data to predict weather and storms?) |
| **IN CLASS** | VIRTUAL ALTERNATIVE |
| **During the Lesson: (15-20 minutes)**<br>1. Have the students look at the following website: https://www.timeanddate.com/weather/usa/falmouth/climate<br>2. Show the students the graph at the bottom of the page.<br>3. Have the students analyze the graph and see if they can determine what data can be found in the graph.  Point out that these numbers are based on weather reports from 1985-2015 so they are averages. Also point out the map that shows the location where the data was recorded.<br>4. Question the students on the data for average high and low temperatures and average rainfall.<br><br>Examples:<br>What do we know about the temperature in July?<br>What month do we get the most rain?<br>On average, how much rain does Falmouth get in May?<br>If you were going to have someone visit you on Cape Cod, what month would you pick? Why? | **Meet with the Teacher (Zoom): (15-20 minutes)**<br>1. Ask the students to tell you what the cafeteria is serving for lunch today.  Once you have the correct answer, ask them how they know. Answers will include: the lunch menu, we have pizza every Friday, Wednesday is pasta day, etc. Tell them they are using prior knowledge and data to make logical predictions.<br>2. Ask them, What is the weather going to be like tomorrow?  What will the weather be like 6 months from now? We don't know exactly, but if we have data we can make a logical prediction.<br>3. On your screen or chart paper write the words weather data then ask the questions, "What weather data do you think is important to collect?" and "How do you think weather data is collected?" Lead the students if you don't get the answers temperature, wind, precipitation (rain or snow) and thermometers, rain gauges and anemometers (bonus for that one).  You can even discuss the placement of your tools to best collect your data.<br>4. Have the students look at the following website: https://www.timeanddate.com/weather/usa/falmouth/climate |

| | 5. Show the students the graph at the bottom of the page. |
| --- | --- |
| | 6. Have the students analyze the graph and see if they can determine what data can be found in the graph. Point out that these numbers are based on weather reports from 1985-2015 so they are averages. Also point out the map that shows the location where the data was recorded. |
| | 4. Question the students on the data for average high and low temperatures and average rainfall. |
| | |
| | Examples: |
| | What do we know about the temperature in July? |
| | What month do we get the most rain? |
| | On average, how much rain does Falmouth get in May? |
| | If you were going to have someone visit you on Cape Cod, what month would you pick? Why? |
| | **VIRTUAL ACTIVITY** |
| | **Activity: Data Analysis: Use the historical rainfall data (for historical data from other MA towns visit here) for Falmouth, MA to see if students can determine patterns to help predict during which month it will rain the most. Also, because they are using historical data, they can compare years and see changes over time. You may also just pull out a couple of years of data.** |
| | |
| | **For example: Find 1972. Which month had the most rainfall? Which had the least? Compare that to 1968. Which month had the most rainfall? Which had the least? What are possible reasons for this variation? (Teacher hint: Google storms off of Cape Cod in 1972.) You can even have students generate a graph for certain years.** |
| | |
| | **OR** |
| | |
| | **Challenge the students to invent a unique way to gather data during a storm. Have them draw and label their design. No idea is too crazy!** |

| IN CLASS | VIRTUAL ALTERNATIVE |
|---|---|
| **Lesson Closing: (10 minutes)**<br>**Activity: Data Analysis: Use the historical rainfall data (for historical data from other MA towns visit here) for Falmouth, MA to see if students can determine patterns to help predict during which month it will rain the most.  Also, because they are using historical data, they can compare years and see changes over time.  You may also just pull out a couple of years of data.**<br><br>**For example: Find 1972.  Which month had the most rainfall?  Which had the least?  Compare that to 1968.  Which month had the most rainfall?  Which had the least?  What are possible reasons for this variation?  (Teacher hint:  Google storms off of Cape Cod in 1972.)  You can even have students generate a graph for certain years.** | **Lesson Closing (Zoom): (10 minutes)**<br>1. Check in with the students.<br>2. Have the students discuss the patterns they found in the rainfall data. |
|  | **EXPLORE OUTDOORS:**<br>Look at a weather website.  Find historical data for your town for today.<br>Example: the average high and low temperatures for this day or time period.<br>Does today's  weather match the historical data? Is it hotter or colder?<br>Is it precipitating?<br>Is it drier than normal or wetter than normal? |

# Lesson 3: A Recipe for Natural Disaster

| |
|---|
| **Overview of the Lesson:** The students will use their knowledge from the previous two lessons to  see how climate, weather and data analysis can be used to predict and  prepare for natural disasters.  The lesson will include a review of hurricanes, tornados, blizzards and severe thunderstorms. The students will define each natural disaster by its unique characteristics.  The activity for this lesson will be to prepare their families for a natural disaster.<br><br>**Time (minutes): (45-60 minutes)** |
| **Standard(s):**<br>MA STE Standard : 3-ESS2-2<br>Next Generation Science Standard: 3-ESS2-1 and 3-ESS2-2<br>Ocean Literacy Principles: 3, a-d<br><br> |
| **Essential Question(s):**<br>● What are natural disasters?<br>● What causes natural disasters?<br>● How can data analysis help us prepare for natural disasters?<br>● Why is Cape Cod prone to hurricanes?<br><br> |

**Science Objectives:**

- Students will be able to define natural disasters and their characteristics.
- Students will be able to predict the regions where natural disasters are most likely to strike.
- Students will be able to explain how to prepare for a natural disaster.

**Language Objectives and/or Targeted Academic Language:**

| | | | |
|---|---|---|---|
| **natural disaster** | **flash floods** | **blizzards** | **wind** |
| **tornados** | **thunderstorms** | **hurricanes** | |

**Anticipated Student Preconceptions/Misconceptions (optional):**

**Instructional Materials/Resources/Tools:**
SmartBoard/Chart paper
Computer/Internet
Hurricane Preparedness Worksheet

**Assessment:**
Correct completion of Hurricane Preparedness Worksheet
Teacher observation.

**Instructional Tips/Strategies/Suggestions for Teacher:** These lessons were developed to utilize the 39 NOAA Live! Recorded Webinar Videos. While certain video clips were pulled out to highlight concepts, you may want to look at the whole playlist on YouTube to see the additional resources available. If your class has a particular interest, you may find a more relevant webinar to highlight in the video section of the lesson.

**Science and Engineering Practices included (put the included ones in bold):**
1. **Asking questions (for science) and defining problems (for engineering)**
2. **Developing and using models**
3. **Planning and carrying out investigations**
4. **Analyzing and interpreting data**
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. **Obtaining, evaluating, and communicating information**

**Notes about Science and Engineering Practices included:**

---

**Lesson Overview:** The students will use their knowledge from the previous two lessons to see how climate, weather and data analysis can be used to predict and prepare for natural disasters. The lesson will include a review of hurricanes, tornados, blizzards and severe thunderstorms. The students will define each natural disaster by its unique characteristics. The activity for this lesson will be to prepare their family for a natural disaster.

---

| IN CLASS | VIRTUAL ALTERNATIVE |
|---|---|
| **Opening/Engagement: (10-15 minutes)**<br>1. Have the students recall their prior knowledge of severe storms or natural disasters. Make a list on the SmartBoard or chart paper of all the storms they can name. They should name hurricanes, tornados, blizzards and severe thunderstorms. If they say earthquakes, remind them that earthquakes are not directly caused by weather.<br>2. On the SmartBoard or chart paper, list hurricanes, tornados, blizzards and severe thunderstorms. Have the students list the unique characteristics for each storm. See list of possible answers in resources. | **Independent Assignment: (10-15 minutes)**<br>1. Before the students meet with the teacher, have the students watch the following 4 clips from a scientist from the National Hurricane Center in Florida:<br><br>NOAA Live! Webinar  19 - 1. What is a hurricane? - 2:18-9:01  2. Hurricane Season - 9:01-14:21 3. Hazards - 21:00-26:16 4. Flooding - 26:21-31:48<br><br>2. In Google Classroom, have the students complete a short assignment on a Google Doc:<br><br>What are the characteristics of a hurricane? |

| | When is Hurricane Season? <br> Where do hurricanes form? <br> What are the dangers in a hurricane? |
|---|---|
| **IN CLASS** | VIRTUAL ALTERNATIVE |
| **During the Lesson: (20-25 minutes)** <br> 1. We are going to focus on hurricanes today. Project a map of the [east coast](#) on the SmartBoard. Ask the students: Why is Cape Cod prone to hurricanes? They should come up with: near the ocean, warm weather in the summer, we get a lot of our weather from the south. (NOAA Live! Webinar video clips that talk about why the East Coast is prone to hurricanes are: <br> [NOAA Live! Webinar 19](#) - "Getting Prepared for Hurricane Season" - 9:02-10:26 <br> [NOAA Live! Webinar 16](#) - "Explore the World with NOAA's Fun, New App" - 13:24-15:25) <br> 2. We are going to watch 4 clips from a scientist from the National Hurricane Center in Florida to learn about hurricanes: what they are, when they tend to form, and the dangers they pose. <br> [NOAA Live! Webinar 8](#) - Hunting Hurricane with a NOAA Pilot - 30:16-31:51 <br> [NOAA Live! Webinar  19](#) Getting Prepared for Hurricane Season - 1. What is a hurricane? - 2:18-9:01  2. Hurricane Season - 9:01-14:21 3. Hazards - 21:00-26:16 4. Flooding - 26:21-31:48 <br> 3. Lead the lesson and stop the video as needed to discuss important facts and fill in at least one observation from each video segment on their observations sheet. | **Meet with the Teacher (Zoom): (15-20 minutes)** <br> 3. We are focusing on hurricanes today. Project a map of the [east coast](#) on your screen. Ask the students: Why is Cape Cod prone to hurricanes? They should come up with: near the ocean, warm weather in the summer, we get a lot of our weather from the south. (NOAA Live! Webinar video clips that talk about why the East Coast is prone to hurricanes are: <br> [NOAA Live! Webinar 19](#) - "Getting Prepared for Hurricane Season" - 9:02-10:26 <br> [NOAA Live! Webinar 16](#) - "Explore the World with NOAA's Fun, New App" - 13:24-15:25) <br> 4. Have the students recall their prior knowledge of severe storms or natural disasters.  Make a list on your screen or chart paper of all the storms they can name.  They should name hurricanes, tornados, blizzards and severe thunderstorms.  If they say earthquakes, remind them that earthquakes are not directly caused by weather. <br> 5. On your screen or chart paper, list hurricanes, tornados, blizzards and severe thunderstorms.  Have the students list the unique characteristics for each storm. See list of possible answers in resources. |
| | VIRTUAL ACTIVITY <br> **Activity: Prepare for a natural disaster. Using your Chromebook, go to** <br> **https://www.weather.gov/wrn/2018-hurricane-preparedness-videos** |

| | Take notes on your **Hurricane Preparedness Worksheet.** After viewing the clips, write in your Writer's Notebook why it is important to prepare for a hurricane. List 5 steps that you and your family can take to prepare for a hurricane.<br>Teacher reference: **PDF of the MA Homeowner's Handbook** that WHSG made for preparing for coastal hazards. Contact WHSG for a paper copy. |
|---|---|
| **IN CLASS** | <span style="color:#3a6ea5">VIRTUAL ALTERNATIVE</span> |
| **Lesson Closing: (20 minutes)**<br>**Activity: Prepare for a natural disaster. Using your Chromebook, go to**<br>**https://www.weather.gov/wrn/2018-hurricane-preparedness-videos**<br>**Take notes on your Hurricane Preparedness Worksheet. After viewing the clips, write in your Writer's Notebook why it is important to prepare for a hurricane. List 5 steps that you and your family can take to prepare for a hurricane.**<br>**Teacher reference: PDF of the MA Homeowner's Handbook that WHSG made for preparing for coastal hazards. Contact WHSG for a paper copy.** | **Lesson Closing (Zoom): (10 minutes)**<br>1. Check in with your students<br>2. Review the Hurricane Preparedness Worksheet |
| | **EXPLORE OUTDOORS:**<br>Pretend a hurricane is a few days away. What could you do around your house to better prepare for the hurricane if it hit your town. What can you do around your house? Do you have enough supplies? Would your pets be safe? What do you think the town should do to prepare? Where can you find more information on hurricane preparedness? |

# Lesson 4: Your Cape Cod Climate

| |
|---|
| **Overview of the Lesson:** In this lesson we will examine the climate on Cape Cod.  The students will analyze historical climate data for Falmouth.<br><br>**Time (minutes): (45-60 minutes)** |
| **Standard(s):**<br>MA STE Standard : 3-ESS2-2<br>Next Generation Science Standard: 3-ESS2-1 and 3-ESS2-2<br>Ocean Literacy Principles: 3, a-d |
| **Essential Question(s):**<br>● What are some of the climate characteristics of Cape Cod? |
| **Science Objectives:**<br>● Students will be able to describe the climate on Cape Cod.<br>● Students will be able to explain how our climate affects our everyday lives. |
| **Language Objectives and/or Targeted Academic Language:**<br><br>**ecosystem** |
| **Anticipated Student Preconceptions/Misconceptions (optional)** |
| **Instructional Materials/Resources/Tools:**<br>SmartBoard/Chart paper<br>Computer/Internet |

**Assessment:**

Completed Project

Teacher observations

---

**Instructional Tips/Strategies/Suggestions for Teacher:** These lessons were developed to utilize the 39 NOAA Live! Recorded Webinar Videos. While certain video clips were pulled out to highlight concepts, you may want to look at the whole playlist on YouTube to see the additional resources available. If your class has a particular interest, you may find a more relevant webinar to highlight in the video section of the lesson.

---

**Science and Engineering Practices included (put the included ones in bold):**
1. **Asking questions (for science) and defining problems (for engineering)**
2. **Developing and using models**
3. **Planning and carrying out investigations**
4. **Analyzing and interpreting data**
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. **Obtaining, evaluating, and communicating information**

**Notes about Science and Engineering Practices included:**

---

**Lesson Overview:** In this lesson, the students will explore Cape Cod's climate and its effects on our everyday lives. They will investigate how our weather is impacted by its climate. What would a year be like on Cape Cod and how can we use data to predict our weather and prepare for natural disasters.

---

| IN CLASS | VIRTUAL ALTERNATIVE |
|---|---|
| **Opening/Engagement: (10-15 minutes)**<br>1. Ask the students to look out the window and describe today's weather. Depending on the time of year, you will get a variety of answers. | **Independent Assignment: (10-15 minutes)**<br>1. Teacher: This activity must be assigned and take place the week before you start this lesson. Visit a weather website and take a screenshot of the predicted weather in your town for the next week. |

| | |
|---|---|
| 2. Using a weather website, project the predicted weather for your location to see if the two match. Discuss why or why not. Things to think or talk about: Did the students take into consideration all the factors scientists use to predict weather? Is the website prediction for the specific spot the class is located at or the whole town? Can the weather be different in various parts of town? | Student assignment: Each student will be recording the weather outside their home once a day for a week.<br><br>2. In Google Classroom, have the students record the weather outside their home for a week. What is the temperature, is it sunny, partially sunny, or overcast? Is there precipitation? |
| **IN CLASS** | **VIRTUAL ALTERNATIVE** |
| **During the Lesson: (20 minutes)**<br>1. Discuss what the weather would look like during a normal year on Cape Cod.<br>2. Split the class into 4 groups. Name each group Winter, Spring, Summer and Fall. Instruct the groups that they will use their knowledge of Cape Cod's climate to predict the weather for their assigned season.<br>3. Discuss resources they should take into consideration to make their predictions. They will be able to use prior knowledge, historical weather data and approved weather websites to complete their assignment. | **Meet with the Teacher (Zoom): (15-20 minutes)**<br>1. Compare the weather data the students collected with the predicted weather for the week to see if the two match.<br>2. Discuss why or why not. Things to think or talk about: Did the students take into consideration all the factors scientists use to predict weather? Is the website prediction for the specific spot the class is located at or the whole town? Can the weather be different in various parts of town?<br>3. Compare the student's data with each other. Is there variability between what student's observed on the same day? Why? |
| | **VIRTUAL ACTIVITY**<br>**Activity: Create a Climate and Weather Wheel - the students will create a wheel where they will use Cape Cod weather data to predict a year's weather. The wheel will have the time of year, average temperature, likelihood of storms and what the students might be doing at that time will be doing at that time of year.**<br>**Instructions for Climate and Weather Wheel -**<br>**https://docs.google.com/document/d/1-XHP7Lx8dnq3J8_-zVeiG8DGIz mxHG5UUexsJ2IudZM/edit** |
| **IN CLASS** | **VIRTUAL ALTERNATIVE** |
| **Lesson Closing: (20 minutes)** | **Lesson Closing(Zoom): (10 minutes)** |

| Activity: Create a Climate and Weather Wheel - the students will create a wheel where they will use Cape Cod weather data to predict a year's weather. The wheel will have the time of year, average temperature, likelihood of storms and what the students might be doing at that time will be doing at that time of year.<br>Instructions for Climate and Weather Wheel - <br>https://docs.google.com/document/d/1-XHP7Lx8dnq3J8_-zVeiG8DGIzmxHG5UUexsJ2IudZM/edit<br><br>Finished Picture - | 1. Check in with the students<br>2. Have the students show their Climate and Weather Wheels. |
| --- | --- |

# Information to Support Teaching Learning - Dive Deeper

What additional resources can support teachers in developing background understanding of content or ideas in this unit?

Woods Hole SeaGrant: https://seagrant.whoi.edu/suggested-educational-resources-for-use-during-school-closures/webinars-noaa-live/

Complete List of NOAA Live! Webinars: https://www.youtube.com/playlist?list=PL1CGd4Scv4GICVRODGA8RRvzocNN1lL8H

MA Precipitation Database: https://www.mass.gov/service-details/precipitation-database

Epic Books - https://www.getepic.com/

If you use the NOAA Live! webinars and curriculum in your class you are encouraged to contact Grace Simpkins at Woods Hole Sea Grant to receive free

NOAA Live! iron-on patches for each of the students in your classroom.  Please e-mail Grace at gsimpkins@whoi.edu

## List of Unit Resources (in lesson sequence)

What additional resources can support the teaching and learning of this unit?  What resources can

support the teacher in implementing the unit?

### Lesson 1:

Physical Map - https://storage.googleapis.com/gweb-uniblog-publish-prod/images/New-global-view.max-1000x1000.jpeg

Climate Zone Map - https://layers-of-learning.com/wp-content/uploads/2010/01/Climate-Zones-Map.pdf

Completed Map - https://layers-of-learning.com/wp-content/uploads/2019/05/climate.png

Comparing Weather and Climate - https://www.youtube.com/watch?v=_fANLICuYB8

## Lesson 2:

Weather Data - https://app.discoveryeducation.com/learn/videos/5c0e3d4f-4486-4009-8198-3d64a6ae6ecb/

Time and Date - https://www.timeanddate.com/weather/usa/falmouth/climate

NOAA Live! Webinar clips:  saildrone, tornado - truck with tools, hurricane hunter - airplanes, weather - weather balloons minutes 43:56-46:26

MA Precipitation Database: https://www.mass.gov/service-details/precipitation-database


## Lesson 3:

East Coast Map - **https://wordpress.accuweather.com/wp-content/uploads/2010/04/590x334_04301437_atlantic-1.jpg?w=632**

Hurrican Preparedness - **https://www.weather.gov/wrn/2018-hurricane-preparedness-videos**

Natural Disaster Characteristics Worksheet

Hurricane Preparedness Worksheet

## Lesson 4:

Falmouth Weather - **https://www.wunderground.com/weather/us/ma/falmouth**

Weather Recording - **https://www.easyteacherworksheets.com/pages/pdf/science/answer/twopages/weather/38.html**

Instructions for Climate and Weather Wheel **- https://docs.google.com/document/d/1-XHP7Lx8dnq3J8_-zVeiG8DGIzmxHG5UUexsJ2IudZM/edit**

**Curriculum Embedded Performance Assessment (CEPA; if applicable)**
Detail the performance assessment and include any rubrics or resources