



Curriculum Units by Fellows of the Yale-New Haven Teachers Institute  
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## **The Impacts of Weather and Climate on Communities**

Curriculum Unit 22.01.03  
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### **Introduction**

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This unit is designed to help third-grade students understand the Earth's systems and how weather and climate impact different regions of the world. More specifically, students will use research skills, along with tracking their own data on weather in their neighborhoods, to find out if there are any similarities or difference that correlate to the season or region in which they live. Within this unit, students will explore the beauty of writing about nature while being outside in nature both at home and at school. This will allow students to take a moment to notice nature around them. In addition, students will be able to be conscious about the effects weather has on a community and the change in different weather patterns. Students will also have the opportunity to explore different severe weather events that have an effect on their own communities or other regions, and how severe weather can impact animal species. This unit will allow students to become more invested in the study of weather and climate because they will be experiencing it daily.

### **Rationale**

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This unit uses the Next Generation Science Standards (NGSS) assigned to the third-grade curriculum. I work in a Pre-Kindergarten (three years old) to eight grade, Inter-district International Baccalaureate (IB) STEM Magnet School, in the city of New Haven. Being a Title 1 school and having a double magnet theme, my school has shifted its focus to be on STEM, with a primary focus on the S, which is science, while keeping the International Baccalaureate theme, connecting to communities around the world. In third grade, students study the Earth's Systems and how weather and climate impact different regions of the world. Specifically, students will use the data they find to create tables and displays to describe typical weather conditions and patterns expected during a particular season in their region. Additionally, students will be able to conduct research to build their knowledge and make a claim to design a solution to reduce negative impacts of weather within a region. Students will be able to use so many different skills along with teamwork with their peers to complete this unit.

Elementary age students grasp new topics more easily when topics are relatable. To make this unit engaging

for students, they will be studying the weather around them by going outside daily and recording what they see, feel, hear and smell in their science journals. Since my school is an inter-district magnet school, we service students from all of New Haven County, whose towns range from the shorelines to the cities to even northern farmlands. Students will have the opportunity to track the daily weather not only at school, but also in their town. This data will allow students to compare with one another how the weather patterns in their neighborhood are similar to or different from the weather at school in New Haven. This will also help students become more aware of the environments where they live and their effect on the weather compared to their classmates' homes and where they go to school.

Throughout the unit, students will have the opportunity to observe and report the weather by becoming local meteorologists. To do that, students need to understand the role of a meteorologist and how they play an important part in communicating weather, weather patterns and weather hazards in a region or community. Students will have the opportunity not only to watch some meteorologists report on the news from different regions to broaden their knowledge about weather reports but meet a real meteorologist that works in downtown New Haven, Connecticut. *WTNH News 8 New Haven* is located at 8 Elm Street in New Haven, Connecticut. They have worked with schools in New Haven County to educate students about weather forecasting and television broadcasting. There are currently five meteorologists that are connecting with schools to educate students by coming to the school in the Mobile Weather Lab Jeep to give them hands-on experiences. This field lesson allows students to meet and discuss weather with professionals. It also opens the opportunity for students to connect to people living and working in their community.

After reviewing the role of a meteorologist and the importance of their job, students will be able to use what they learned to really immerse themselves in nature by keeping a weather journal. This routine will allow students to find a quiet, independent spot in the courtyard, field or playground of our school to sit and take five to ten minutes to observe the nature and weather around them. They will learn how to track their senses over a period of time and find if there are any similarities or changes that occur over a period of time. Having students go outside and be in nature will help stimulate their brains. Research has shown that being outdoors and with nature for at least two hours a week produces an increase in academic performance and concentration in the classroom (Kou, 2019).

An additional field trip opportunity takes place at the *Connecticut Science Center*, located in Hartford, Connecticut. In 2019, the Connecticut Science Center opened a new exhibit called "Our Changing Earth", which gives students the opportunity to investigate the impacts of our changing climate and how humans have influenced the environment. The exhibit offers galleries about how Connecticut's landscapes have changed over time, in addition to ice age glaciation that once covered Connecticut. In addition, this exhibit allows students to see a scale version of historical flood heights that have taken place in Hartford, Connecticut. There are also opportunities for students to use a Geographic information System powered by a touchscreen device to use the data to predict future impacts of big storms on the coastline and the effects of rising temperatures on the state. Furthermore, students can engage with the Hurricane Simulator where students can experience hurricane force winds in real time. After their experience, students can have the opportunity to learn about technology's role in forecasting weather and how to record the weather just like a meteorologist by using real time weather data in the "WFSB Early Warning Pinpoint Doppler Radar Exhibit."

These field trip experiences will allow students to connect with weather and climate and natural disasters in real time. These opportunities will allow them to make observations and connections to understand how there are both positive and negative effects of climate and weather that have also impacted plants, animals, humans and the environment in which they live. Since students learn more about climate change in fourth

grade, some lessons and field trip exhibits will exposed the students to climate change in addition to learning just about climate in a particular area.

In addition to teaching students about the Earth's climate and weather systems, students will also have the opportunity to learn and experience nature first hand. They will be exposed to different weather patterns that they experience in their climate zone along with other climate zones as well by watching videos and experimenting with some activities. Students will learn how to appreciate nature by engaging in outdoor writing and learning opportunities as well.

This aligns with the mission statement of King Robinson Inter-District International Baccalaureate STEM Magnet School's because by the end of the unit, students will be able to "take action and become empowered to be responsible, productive and engaged 21<sup>st</sup> century global citizens, who are respectful, open minded and reflective with positive attitudes. Students will use their skills to take action that lead to positive contributions to their global environment."

## **What is Climate? How Does Climate Influence a Particular Area?**

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While weather is constantly changing in an area, whether it is hour by hour, day by day, week to week or even year by year, climate is the long term pattern of weather in a particular region and can take at least thirty years to be classified. Climate is determined by a region's climate system. A climate system has five major components: the atmosphere, the hydrosphere, the cryosphere, the land surface and the biosphere (National Geographic Society, 2022).

The atmosphere is the most important part of the climate system because the make-up and the movement of gasses surrounding the Earth can change, influenced by natural and human made forces. The hydrosphere, which includes different variations of temperature and the salt content in ocean water, changes at a much slower pace compared to the atmosphere. The cryosphere is another dependable part of the climate system that helps regulate the thermohaline circulation which begins in the Earth's polar regions (National Geographic Society, 2022). When ocean water gets cold, sea ice forms, causing the water around the ice to become saltier. In turn, this makes the ice sheets more dense and causes them to sink. This has a huge influence on the marine ecosystems and biodiversity. The land surfaces which include the vegetation and landforms influence climate by how the Sun's energy is used on Earth. Plants, sand, soil and asphalt impact evaporation rate and temperature on Earth. Lastly, the biosphere, which contains all the living things on Earth, influences the climate through its plants and landscapes which can be altered by these living things. For example, photosynthesis helps regulate the flow of greenhouse gasses in the atmosphere. In addition, oceans and forests located in the biosphere serve as carbon sinks that have a cooling impact on a climate.

Our planet Earth is home to about 8.7 million species, including animals, insects, plants, fungi, single celled organisms, algae and bacteria. This is only possible because of the various climates that exist on Earth and the changes in climate that have occurred over time (National Geographic Society, 2022). Since climate has such a significant impact on an environment, living species, cultures and civilizations have had to also change and adapt to the climate as it has changed over time.

One example of climate change impacting a community during early civilization is clothing. A climate of frigid,

wet temperatures had influenced the Indigenous Arctic cultures of Europe, Asia and North America when it came to developing clothing to withstand it. (National Geographic Society, 2022). These Indigenous people created clothing that was warm, tough, resistant and sturdy out of animal skin and fur.

Another example of the impact of climate change on a community is how early civilizations built their houses. The ancient Anasazi people of southern North America would construct their pithouses into tall cliffs made out of clay and stone, in order to create a shady area to keep the people cool in the hot, dry desert (National Geographic Society, 2022). Later construction also included adding mud to the outside walls and roof to protect from the weather.

One last example of the impact of climate change on communities during ancient civilizations is the evolution of agriculture (National Geographic Society, 2022). For instance, people in ancient Mesopotamia and India relied on the climate to be mild, since the area needed the rivers to stay full to utilize the water supply. This was important because they needed to grow crops all year round while they were experimenting and adapting to new farming techniques. In addition, it was important that their livestock was also able to survive in the mild climate. Today, farmers still use climate when planning for their growing season. Farmers rely on the typical climate in a particular area because if they did not, farming would become extremely difficult as crops would not survive or become more expensive to sell.

## **Weather Systems and Patterns**

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Weather impacts our daily lives and does not happen randomly, but rather depends on scientific principles and processes. There are patterns in the atmosphere that influence the weather on Earth that are caused by weather global systems that include wind, air masses and fronts. Our weather is determined by clouds, temperature, precipitation, winds and storms (Stone & Meinke, 2006). In addition to these global systems, the weather system is determined by our local conditions like the area's latitude, geography, moisture levels and solar energy levels. This is why Earth does not have one specific weather or climate system, but rather many different systems.

## **Climate Zones: The Köppen-Geiger Climate Classification System**

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Wladimir Köppen (1846-1940) was a German botanist and climatologist who created a climate classification system categorized by climate zones throughout the world based on local vegetation at the end of the 19th century. He worked with Rudolf Geiger (1894-1981), a German climatologist and meteorologist, and found that vegetation and climate linked together based on two key factors: temperature and precipitation. Since vegetation relies heavily on temperature and precipitation, they found that areas with more rainfall and higher temperatures had more forests compared to areas with less rainfall and high temperatures tend to be deserts. The Köppen-Geiger Climate Classification System is separated into five climate zones based on temperature that allows different vegetation growth. In 1928, they created a map of the world and used different shades of colors to represent the different climate zones. The five climate zones are Zone A: Tropical Climates, Zone B: Dry Climates, Zone C: Mild Climates, Zone D: Continental Climates, and Zone E: Polar

Climates. All the climate zones besides Zone B: Dry Climates are classified by temperature. Zone B is classified by dryness so categorized by precipitation. (National Geographic Society, 2022).

It's important to understand these five climate zones because each is categorized into different climate regions that are still used in the present day (National Geographic Society, 2022).

### **Zone A: Tropical Climates**

Tropical Moist Climates can be found about 15 to 25 degrees latitude northwards and southwards of the equator. Within this category, there are three climate types in the tropical group: Tropical wet, tropical monsoon and tropical wet and dry. Tropical wet climates are also known as rainforests where the temperature is warm ranging from 68-73 degrees Fahrenheit in the mornings and 86-91 degrees Fahrenheit in the afternoons. It is the most predictable weather on Earth and gets over 59 inches of rain a year. Some examples of tropical wet climates are Hawaii, Kuala Lumpur, Malaysia and Belem, Brazil. Next, the Tropical monsoon climates can be found in southern Asia and West Africa. In the summertime, these monsoons bring a large amount of rainfall to the region. People living in these regions depend on the seasonal rain to bring water to their crops for survival. The most famous monsoon climate patterns take place in India and Bangladesh. Lastly, the Tropical Wet and Dry climates take place in the grasslands ecosystem. This can also be called the Savanna. Tropical wet and dry climates are located near the equator and have three seasons: cool and dry, hot and dry, and hot and wet. This region is more unpredictable as when rain is light, people and animals suffer through droughts, and during rainy years, the region can experience flooding. Some examples of this region include Havana, Cuba, Kolkata, India and Africa's Serengeti Plain.

### **Zone B: Dry Climates**

Dry Climate zones can be found 20 to 35 degrees north and south of the equator. Precipitation is extremely low ranging from four to twelve inches of rain each year. There are two types of dry climate types called arid and semiarid. The hottest regions of the world are arid climates, such as Death Valley National Park, located in California USA. The highest temperature ever recorded in this area was 134 degrees Fahrenheit on July 10, 1913. Another arid place on Earth is the Atacama Desert of Chile, located on the west coast of South America, which is known as the driest place on Earth as it has never rained in this area. Semiarid regions receive 10 to 20 inches of rainfall per year. They are located between arid and tropical regions. An example of a semiarid region is the Australian outback.

### **Zone C: Mild Climates (Temperate Climate)**

The Mild Climate zone has a distinct cold season and is influenced by latitude and a region's position on the continent. There are three types of Mild Climates: the Mediterranean climate, the humid subtropical climate and the marine west coast. The Mediterranean climate can be found between 30 and 40 degrees latitude and along the shores of the Mediterranean Sea, where their summers are warm and short and their winters are rainy. The humid subtropical climates are located on the eastern sides of the continents. Some examples include Savannah, Georgia, Shanghai, China and Sydney, Australia. Their summers are hot and humid and winters are extremely cold. It is common for these regions to get 30-65 inches of rain each year and also experience hurricanes and violent storms. Lastly, the Marine West Coast climate has longer and cooler winters where precipitation occurs two-thirds of the winter days and the temperature averages 41 degrees Fahrenheit. Cities like Seattle, Washington USA and Wellington, New Zealand are examples of this type of climate.

## **Zone D: Continental Climates**

The Continental Climate zones experience harsh, cold winters with lots of snow and shorter growing seasons. These climates occur only in the Northern Hemisphere. This zone experiences extreme seasonal changes. In addition, powerful thunderstorms and tornadoes are also seen here. There are three types of continental climates: warm summer, cool summer and subarctic. Most Eastern European countries including Romania and Georgia have warm summer climates with wet summer seasons similar to monsoon climates. Cool summer climates have harsh winters with snow, low temperatures and cold winds. Lastly, the subarctic climate experiences very long, cold winters with little precipitation. This is seen in Scandinavia and Siberia.

## **Zone E: Polar Climates**

Polar Climate zones are located in the northern coastal areas of North America, Europe, Asia, Greenland and Antarctica. These polar climates have cold temperatures all year round and experience 50 degrees Fahrenheit at most during the warmer months. The two polar climates types are called Tundra and Ice Cap, which are located near the North and South Poles within the Arctic and Antarctic Circles. In tundra climates, July is the warmest month, reaching the average temperature of 50 degrees Fahrenheit. Summers are rather short, but animals and plants thrive. Wildflowers, birds, whales, insects, fish and even people have adapted to live on the tundra for thousands of years. On the other hand, the ice cap climate is completely different compared to the tundra climate. Temperatures are extremely cold, rarely rising above freezing even in the summer months. Although precipitation is low, the presence of ice helps keep the weather cold. A fun fact about the ice cap climate is that the largest, driest desert on Earth is located in Antarctica.

## **The Impact of Severe Weather**

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Severe weather is generated by the changes in the atmosphere's temperature, wind or air pressure. Some examples of these extreme weather events include thunderstorms, damaging winds, tornadoes, hail storms, flooding, drought and winter storms.. All of these can be exceptionally dangerous and cause a lot of damage.

### **Thunderstorms**

A thunderstorm is a rain shower that includes thunder and lightning. A thunderstorm becomes severe when it contains one of the following: hail one inch or greater, wind gusts exceeding 50 knots or 57.5 miles per hour, or a tornado. It is estimated that over sixteen million thunderstorms occur worldwide each year. In the United States, thunderstorms occur mostly in the spring and summertime. There are about 100,000 thunderstorms each year; only 10% of those thunderstorms, however, are considered extreme weather and reach severe levels. In the United States, Florida has reported having the most thunderstorms; while the states that have reported the most severe thunderstorms are Iowa, Texas and Louisiana.

### **Damaging Winds**

Damaging winds, also known as straight- line winds, are classified when they exceed 50-60 miles per hour. This occurs as a result of a thunderstorm's downdraft. It is common for these severe winds to cause more damage than a tornado. The faster the wind speeds are, the more damage can occur, extending to hundreds of miles. People most at risk for injury or death from a damaging wind storm are those who live in mobile

homes.

## **Tornadoes**

A tornado is a narrow, violently rotating column of air that extends from a thunderstorm to the ground. Tornadoes are one of the most violent phenomena of all storms that humans experience. They take place all over the world, and affect the United States specifically 1,200 times a year. Although tornadoes can take place any time of year, they are regularly seen in the southern plains (Texas, Oklahoma and Kansas) in May and June and in the northern plains and upper Midwest (North and South Dakota, Nebraska, Iowa, and Minnesota) in June and July.

## **Hail Storms**

Hail is a type of precipitation consisting of solid ice that forms inside thunderstorm updrafts. Hailstorms are formed when raindrops are carried upward from thunderstorm updrafts into extremely cold areas of the atmosphere and freeze. Hail falls to the ground when it becomes heavy enough to survive the strength of the thunderstorm updraft and is pulled toward the Earth by gravity. Hail can fall at different speeds and be different sizes.

For students to really understand the different sizes of hail I have included some examples to help them visualize the different diameters:

For small hailstorms, less than 1 inch in diameter, the fall speed is between 9-25 miles per hour. For reference, the hail can look as small as a pea or as large as a nickel. Hailstorms that take place during a thunderstorm can be 1 to 1.75 inches in diameter and fall at a speed between 35-40 miles per hour. For reference, the hail can be as small as a quarter or as large as a golf ball. In the strongest and largest hail storm, it was reported that the hail was 2 to 4 inches in diameter and expected fall speed to be 44 to 72 miles per hour. For reference, the hail can look as small as a tennis ball or as large as a softball.

Although Florida has the most thunderstorms, Nebraska, Colorado and Wyoming are known to have the most hailstorms. They have an average of nine hail days per year. The most damaging hail storms have occurred in China, Russia, India and Northern Italy. The largest hailstorm in the United States took place in Vivian, South Dakota on June 23, 2010. The hail had a diameter to 8 inches and weighed 1 pound and 15 ounces. Hail can cause a lot of damage to homes and cars and can be deadly to people and animals.

## **Flooding**

Flooding is an overflowing of water onto land that is normally dry. Flooding can occur during heavy rain storms, when snow melts quickly or even when dams break. The number of floods can transpire within minutes or over a long period of time. They can last hours, days or even weeks depending on the severity of the flood. Floods are the most common of all weather related natural disasters. Floods occur in every state and territory here in America. The most dangerous kinds of floods are called flash floods. Flash floods take place when heavy rainfall exceeds the ability of the ground to absorb it. This causes a rapid rise of water in a short amount of time. Areas that are at the most risk from flash floods are densely populated areas or areas near rivers or dams. It is reported that in the United States, floods kill more people each year than tornadoes, hurricanes or lightning.



## **Droughts**

A drought is a period of time when an area or region experiences below normal precipitation. The lack of rain or snow can reduce groundwater, minimize stream flow, damage crops and cause water shortage. Although it is hard to predict when a drought begins and when it ends, it can last weeks, months or even years. The longer a drought lasts, the more harm it will cause for people. This is because clean drinking water is crucial for all living things. Crops need clean water to grow with the help of irrigation. Irrigation is only possible when there is enough water in surrounding rivers, lakes, streams or groundwater. During a drought, these sources of water can be lessened or even dried up completely. In turn, this can prevent crops from being irrigated and result in them dying. In the United States, the states that face the most droughts are California, Nevada, Utah and Arizona. Droughts are the second most costly weather events after hurricanes. This is resulting in more frequent and severe droughts in these regions of the United States (Bates, 2021).

## **Winter Storms**

A winter storm is a combination of heavy snow, blowing snow and dangerous wind chills. Examples of winter storms are blizzards, ice storms and snow squalls. They can be very dangerous and life threatening depending on the severity of the storm. Blizzards are formed from blowing snow and winds with very low visibility. Blizzard winds can reach average speeds over 35 miles per hour. Visibility can be reduced to a quarter mile or less for at least three hours. An ice storm can cause at least .25 inches of ice to accumulate on an exposed surface. This creates very dangerous driving and walking conditions. In addition, the weight of the ice can also cause tree branches and powerlines to snap easily. Snow squalls are intense, brief snow showers combined with strong winds. They cause sudden white out conditions combined with falling temperatures that produce icy roads in just minutes. They take place quickly and last less than an hour, but can cause a lot of damage due to the lack of visibility while driving.

## **Teaching Strategies: Nature's Benefits, Sit Spots**

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Did you know that one hundred- twenty minutes of a dose of nature is how long it takes for people to say they feel healthy and have a strong sense of well-being? A team led by Mathew White of the European Centre for Environment and Human Health at the University of Exeter conducted a study of 20,000 people and found that people who spend two hours a week in green spaces reported to be in good health both physically, mentally and emotionally. The study proved that, "Nature is not only nice to have, but it's a benefit for physical health and cognitive function" (Robbins, 2020).

With the growing research taking place, health experts, researchers, policy makers and government officials are working together to propose changes to bring more nature into people's everyday lives. For instance, in urban areas, cities are designing schools and office spaces with large windows, access to trees and green spaces, or blue spaces with access to aquatic environments. There has been an increased number of "forest schools", where most of the learning takes place outdoors. In the United States, Oregon passed a bill to raise money for outdoor schools and the state of Washington became the first state to license outdoor preschools, where most of the play and learning occurs outside.

Here in our own backyard, families in New Haven county have the opportunity to sign their children up for a



NatureYear program that connects children with deep, sustained and meaningful experiences with nature. This program takes place in the woods at Common Ground High School located at 358 Springside Ave in New Haven, Connecticut. Their mission is to center learning and leadership by inviting people across all ages and identities to connect to their urban environment, build community, grow into their full potential and contribute to a just and sustainable world. NatureYear provides children ages 5 to 13 an opportunity to immerse themselves in the natural world once a week instead of reporting to their usual public school or homeschooling environment. The NatureYear program has children explore the farm on campus through the gardens and animal yards. It also integrates the forest trails of West Rock Ridge State Park. NatureYear takes place outdoors all year round, in all weather conditions, and breaks the barrier of the typical school day with students in desks and teachers in the front of the room. This program gets children outside for much needed time in nature, while also valuing child voice and student led learning.

The NatureYear program has found that students that attend this program report to have an increase in self-confidence and enthusiasm for new things. Their teachers have observed that students are asking new kinds of questions, becoming risk takers with new things and developing a positive relationship with nature.

### **Taking the Classroom Outdoors**

There have been many studies done over recent years that have proven that students who spend time outdoors during the school day are more likely to perform better in school in different ways. Ming Kou, a researcher that leads the Landscape and Human Health Laboratory at the University of Illinois at Urbana-Champaign, found that people who are exposed to being outdoors, correlate to reduced AD/HD symptoms, aggression and other mental and physical health indicators. She has found that nature does not just benefit a child's mental health, but their ability to learn as well (Kou, 2019).

One study done by Julie (Athman) Ernst and Donna Stanek (2006), which took place in an urban, lower socioeconomic area, found that students at schools with more trees and greenery performed better academically, according to standardized tests, than schools with less green spaces. In addition, another study had students split into two groups, with one group staying in the classroom while the other group had class outside near a garden. Both groups engaged in the same exact science lesson. The results found that the students who worked outside and spent more time in the garden with hands-on experiences were more engaged than the students in the classroom who talked about gardening without hands-on experience. This idea shows how students who were outside and experiencing in activities outside in nature proved to be more beneficial than being indoors in a traditional classroom setting.

Ming Kou found that there are six ways nature helps children learn (Kou, 2019).

1. Nature restores children's attention. Since a child's attention span is important for learning, spending time outdoors by taking a walk or having a view of greenery from a window helps restore their attention. Nature allows children to concentrate on a task and perform better on cognitive tests.
2. Children relieve their stress better from nature. Children are more likely to have less stress when they have access to green spaces. A study showed that children in rural areas who experienced trauma or a stressful life event recovered better with nature nearby as they destress.
3. Nature helps children cope with their impulse control. Many children, including those with AD/HD, struggle with their impulse control during the school day, which in turn interrupts their learning. Green spaces allow children to have more self-discipline and regulate their attention better. This results in children having more academic success.
4. Learning outdoors leads children to be more engaged learners. Although teachers worried that learning

outdoors would lead to more distractions, research has shown that students are more engaged in learning not only when outdoors, but when they transition back to class as well.

5. Time outdoors can increase physical activity and fitness. Children that have access to outdoor spaces and green spaces are more likely to be encouraged to participate in physical activities. In addition, the more time children spend in nature, the better their cardiorespiratory fitness will be, which correlates to higher cognitive processing.
6. Children who spend more time in nature advance their social connections with their peers and creativity. Having children spend more time in nature allows them to experience nature in a more structured way, creating a calmer environment. Their peer to peer relationships are enhanced as they are exploring and problem solving.

### **Engaging Nature with Sit Spots**

Engaging students in nature during the school day, even for a few minutes a day will enhance their concentration on a task and allow them to really take in their surroundings. However, setting up structure when first working outside can be important to set up expectations and allow students to really connect with the nature around them. Having children find a sit spot allows them to find a special spot just for them outdoors. When choosing a sit spot it's important to find a place that is easy to visit, that is appealing and enjoyable to spend time. When observing nature, it is important to take at least ten minutes to take in your surroundings by using your senses. During this time a timer can be used to regulate the time, but have the children not partake in any other activities like reading or writing during these first ten minutes. It's important for them to really engage with the environment. Having students use their senses can also help them enjoy their sit spot more. By having them look around to see different things, listening for different sounds, smelling the different scents around them and feeling the different textures around them will enhance their experiences. It will allow them to connect with nature in a deeper way and reflect on their own thoughts and feelings.

In order for sit spots to work properly, teachers need to be authentic and inspire students to take part in this experience. It's crucial for teachers to model how to wonder and question the things around them in order for students to follow. By doing this, students will become risk takers and take part in an activity that is new to them. This will allow them to become more creative and have the autonomy to direct their own experiences.

Gill Lewis (2017), a children's author who writes about the natural world and animals, says it's important when writing about nature to be outside to experience what is happening around them. By getting outside, it allows writers to use all your senses and put it in your writing. By looking at a setting, it allows writers to express their thoughts with lots of vivid details and allows readers to feel as if they are in a particular place. When writers close their eyes, while observing nature, all of them create details to explain sound. For example, instead of a writer saying it was a windy day, they can transform their writing to say, the wind was whispering throughout the trees and tickled me when it blew through my hair. Writers can use their experience sitting outdoors and feeling the wind and incorporate it into their writing. In addition, using touch to pick up things around them helps writers build the landscape around them and allow them to experience what they want to write about before writing. Gill Lewis suggests children take the time to observe nature around them and then begin writing and drawing about the landscapes around them. She suggests writing in the moment about their outdoor experiences and surroundings can help students create a vivid picture of nature in the moment.

Overall when writing in nature, it's paramount that students are noticing the smaller details. For instance, it's important to look around and ask questions like: How big or small is it? Why does it feel like that? Is it sticky or smooth? Where did this object come from? Did someone put this here or is it supposed to be here? In

addition, looking at details of objects and comparing it to other objects also builds curiosity and inquiry. Asking questions like how are these objects similar and different? Which is bigger? Why are they different colors? Are they all intact or are pieces broken? Lastly, sketching can also enhance a child's experience in nature by allowing them to draw the smaller details and labeling the different parts they notice. With practice, this can help children focus on the shapes, smells, textures and other details of objects, landscapes and even weather.

## Classroom Activities

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These lessons can take place in one class period or broken into different pieces to better suit your class and time allotted each day.

Lesson 1: Discuss what weather is by creating a list of the different weather students have experienced or heard of. Next, brainstorm what this weather looks like, feels like, smells like, sounds like and at sometimes tastes like. Students should understand that they can use their five senses to really understand and experience weather daily. Then, have students watch the video, What is Weather, <https://www.generationgenius.com/videolessons/introduction-to-weather-video-for-kids/> . If you sign up for an account or free trial you will be able to watch the entire video. There are plenty of other videos and or books you can find that introduce this topic. At this point, students should have a clear understanding of the types of weather the atmosphere experiences.

Lesson 2: Students will be introduced to a weather journal. Throughout this unit, students will go outside twice a day to write about the weather and nature around them for 5-10 minutes daily. Students will use their five senses to take what is occurring around them. Students will be asked to take note about the weather and nature around their home and at school in a green space. Students will be introduced to sit spots ( *Look at section: Engaging Nature with Sit Spots*) to first observe the weather and nature and then write about what they feel, see, smell and hear (they will not be tasting anything). Before heading outside, show them this clip, [https://greatergood.berkeley.edu/article/item/six\\_ways\\_nature\\_helps\\_children\\_learn](https://greatergood.berkeley.edu/article/item/six_ways_nature_helps_children_learn) , for them to connect how an author's use this technique when writing about nature, .

Lesson 3: How is Weather Measured? Scientists who study the weather are called meteorologists. Meteorologists use different tools to predict the weather. Students can brainstorm possible tools that they use to measure the weather. Some tools are rain gauge, barometer, thermometer, wind sock, weather vane, anemometer and hygrometer. This video, <https://www.youtube.com/watch?v=5mvrt51Mdu0>, will explain how these different weather instruments help meteorologists predict weather patterns. Some students may have never seen a meteorologist give a report on the news. These two videos, <https://www.youtube.com/watch?v=tmO9cjsj1zc&t=1s> and <https://www.youtube.com/watch?v=GyXP8bmBTC8> , allow students to view how the use of weather instruments allow meteorologists to create a weather report to alert the public. *For more information on connecting with meteorologists in New Haven look at the Rationale section.*

Lesson 4: Create a Rain Gauge. Students will work together to create a rain gauge to measure the amount of precipitation that occurs during a rainstorm. The materials needed for this project include a plastic bottle (precut the top off), paperclips, tape, marker and a ruler. Have students watch this video to help them create

their rain gauge, <https://www.youtube.com/watch?v=IU9CsbAkRbc> . Once they have been created, find a space outside to leave them for five days. Each day go outside and have students journal how much water has accumulated and any other observations they might influence why there is an increase or no increase in water each day.

Lesson 5: What are Seasons? Display a picture of a child wearing clothing to represent summer (short, tank tops, swim suit, etc). Ask students to identify what time of year it is and where this child might live. Ask questions like, what is summer? What are seasons? How many seasons are there? Do all countries have seasons? This video, <https://www.youtube.com/watch?v=b25g4nZTHvM> , explains how the Earth is tilted and for part of the year one of the hemispheres is leaning towards the sun and the other part of the year its tilted away from the sun. The direct sunlight means more sunlight and warmer weather and indirect sunlight means less sunlight and cooler weathers. You can use a globe or ball to simulate this in the classroom so students can see how the “Earth” rotates. While doing this, be sure to highlight how the tilt is what causes seasons in countries. To take a deeper look into this, look at a country that is located near the equator. Show how the countries distance stays close to the sun throughout the year, meaning that those countries near the equator will stay warm most of the year and not experience cold winters. This video, <https://www.youtube.com/watch?v=9n04SEzuvXo> , demonstrates this concept in a visual way. Check out these other videos that further explain why seasons exist: <https://www.youtube.com/watch?v=UQjT5uKp2hg> , <https://www.youtube.com/watch?v=KUU7lyfR34o> , <https://www.youtube.com/watch?v=l64YwNI1wr0> .

Lesson 6: What is a Climate Zone? Students should know the different types of weather and how weather differs throughout the different seasons. This lesson will focus on identifying what is climate and how climate is different from weather. An area’s weather over a long period of time is called climate. Not all places on Earth have the same climate. Climate is important because only certain types of plants and animals can live in a particular climate. This video , <https://www.youtube.com/watch?v=Kp7ZhvjXrMc> ,will teach students about the three main climate zones on the earth: Polar, Temperate and Tropical climate zones. Divide students into five groups and give each group a climate zone: Tropical, Dry, Temperate, Continental and Polar. Provide them with non-fiction picture books, slides or videos for each group to dive deeper into. *Look at the section about Climate Zones: The Köppen-Geiger Climate Classification System to find out more information. You can also use the information to create slides for students to reference.* After the group is done researching, students will create a poster by drawing their climate, labeling the type of weather their climate experiences and list three countries located in their climate.

Lesson 7: What are Extreme Weathers? *Using the information provided in the section, The Impact of Severe Weather, to model and teach different types of extreme weather,* display pictures around the classroom with different extreme weathers labeled with numbers. Have students walk around the room with a paper numbered and have them take five minutes to see if they can identify what extreme weather is taking place in each photo. After the five minutes, have students come back to engage in conversations. Explain to students that extreme weather events occur outside normal weather patterns. This video, <https://www.youtube.com/watch?v=QVZExL00MWA> , further explains the difference between weather and severe weather. After, group students together to become an expert about one severe weather. Provide them a fiction and non-fiction book (on online book link) to each group (look at the materials section below for titles and authors of some fiction and non-fiction books you can provide your students). Groups will use a 3-2-1 organizer to write about three things they learned, two questions they still have and one thing they thought was most interesting they learned about their extreme weather. Groups will then share out and teach the rest of the class about their severe weather.

Lesson 8: How Can Extreme Weather Impact People and Communities? Since students are now experts on a given extreme weather, they will use their knowledge to create awareness to the community of New Haven to help them prepare and stay safe during a hurricane that is coming to their community. Students will take what they have learned from this unit to alert the public and keep them calm and prepared before the storm. Some examples can include creating a news report, be a meteorologist, create a poster, call a town meeting. Let students get creative to show what they know and have learned throughout the unit!

## Reading List for Students

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*Disaster Strikes: Tornado Alley* by Marlane Kennedy

This narrative story follows Wyatt Anderson as he works to protect his animals from tornadoes that are headed towards his farm.

*Tornadoes!* By Gail Gibbons

This book illustrates and shows readers how tornadoes form, how they are classified and what to do in order to stay safe if there is one in their area.

*Anna, Grandpa and the Storm* by Carla Stevens

This chapter book follows Anna and her grandpa as they make the journey through the big snowstorm to get to school in time for the spelling bee.

*Disaster Strikes: Blizzard Night*

A winter trip in the remote Michigan wilderness seems like the perfect way for Jayden to get to know his new foster family, but when the snow really starts to come down, the family van crashes and the three kids must go out into the bleak, white storm to search for help.

*Whiteout! A Book About Blizzards* by Rick Thomas

This book uses illustrations to teach children about blizzards, including whiteouts, strong winds, snowdrifts and wind chill.

*Hurricanes* by Seymour Simon

This picture book uses photography and satellite images to teach students about hurricanes, how they form and precautions you should take during hurricanes.

*What is Climate* by Jennifer Boothroyd

This book explains climate in different parts of the world by showing different climate conditions and explaining different weather characteristics and patterns that exist.

*Tropical Climates* by Cath Senker

This book looks at tropical climates and explores the land and weather in regions with this climate and how plants, animals and people have adapted to life there.

*Temperate Climates* by Cath Senker

This book looks at temperate climates and explores the land and weather in regions with this climate and how plants, animals and people have adapted to life there.

*Desert Climates* by Cath Senker

This book looks at desert climates and explores the land and weather in regions with this climate and how plants, animals and people have adapted to life there.

*Polar Climates* by Cath Senker

This book looks at polar climates and explores the land and weather in regions with this climate and how plants, animals and people have adapted to life there.

*Flood Warning* by Katharine Kenah

This book explore floods, how they start, the different kinds and how to stay safe during and after a flood.

*Tornadoes* by Seymour Sion

This book describes tornadoes, how they are formed and the destruction they can create.

*Extreme Weather: Surviving Tornadoes, Sandstorms, Hailstorms, Blizzards, Hurricanes and More!* By Thomas M. Kostigen

This National Geographic book about extreme weather is based on first-hand accounts and cutting edge science that will teach students what to do, how to stay safe and what happens after an extreme weather event.

*100 Most Destructive Natural Disasters Ever* by Anna Claybourne

This book is about real-life events from around the world that have affected hundreds of thousands of people. It teaches students about why natural disasters occur and how people respond to them.

## Materials

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The materials in this unit are important for students to have while exploring weather, climate and how they influence the people, animals and plants in a particular area. These materials will help students build and expand their knowledge during the unit.

1. Video Links:

<https://www.generationgenius.com/videolessons/introduction-to-weather-video-for-kids/> (Lesson 1)

[https://greatergood.berkeley.edu/article/item/six\\_ways\\_nature\\_helps\\_children\\_learn](https://greatergood.berkeley.edu/article/item/six_ways_nature_helps_children_learn) (Lesson 2)

<https://www.youtube.com/watch?v=5mvrt51Mdu0> (Lesson 3)

<https://www.youtube.com/watch?v=tmO9cjsj1zc&t=1s> (Lesson 3)

<https://www.youtube.com/watch?v=GyXP8bmBTC8> (Lesson 3)

<https://www.youtube.com/watch?v=IU9CsbAkRbc> (Lesson 4)

<https://www.youtube.com/watch?v=b25g4nZTHvM> (Lesson 5)

<https://www.youtube.com/watch?v=9n04SEzuvXo> (Lesson 5)

<https://www.youtube.com/watch?v=UQjT5uKp2hg> (Lesson 5)

<https://www.youtube.com/watch?v=KUU7lyfR34o> (Lesson 5)

<https://www.youtube.com/watch?v=l64YwNI1wr0> (Lesson 5)

<https://www.youtube.com/watch?v=Kp7ZhvJXrMc> (Lesson 6)

<https://www.youtube.com/watch?v=QVZExLO0MWA> (Lesson 7)

## 2. Experiment Materials

Lesson 2: Weather Journal for writing about weather and nature

Lesson 4: plastic bottle (precut the top off), paperclips, tape, marker and a ruler

3. Electronic devices (Chromebook or iPad). This will be needed so students can conduct research throughout their unit.

## 4. Field Trip Experiences & Community Programs

Connecticut Science Center

Common Ground Highschool (NatureYear Program)

WTNH News 8 New Haven (located at 8 Elm Street in New Haven, Connecticut.)

## Teacher Bibliography

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(Athman) Ernst, J., & Stanek, D. (2006). "The prairie science class: A model for re-visioning environmental education within the National Wildlife Refuge System." *Human Dimensions of Wildlife*, 11(4), 255-265.

<https://doi.org/10.1080/10871200600803010>

This study showed that students exposed to learning in nature rather than the same lesson in the classroom



were more engaged with the hands on experience and performed academically better at the end of the lesson.

Bates, S. (2021, September 28). *Drought makes its home on the range – climate change: Vital signs of the planet*. NASA. <https://climate.nasa.gov/news/3117/drought-makes-its-home-on-the-range/>

This resource discusses the impacts droughts are having on farms in the United States related to climate change.

Bilton, H., & Waters, J. (2016). "Why take young children outside? A critical consideration of the professed aims for outdoor learning in the early years by teachers from England and Wales." *Social Sciences*, 6(1), 1-16. <https://doi.org/10.3390/socsci6010001>

This journal article is about a comparative study between Wales and England to better understand how outdoor learning and play contribute to better develop in four and five year olds.

Childhoodbynature.com (2021, August 13). *Nature Journaling For the Mini Naturalist*. Childhood By Nature. <https://www.childhoodbynature.com/nature-journaling-for-the-mini-naturalist/>

This resource explains what nature journaling is and how to get children started with this process. The basic steps include finding a quiet spot to observe, draw and write.

*Climate Change Impacts*. National Oceanic and Atmospheric Administration (NOAA). (2021, August 13). <https://www.noaa.gov/education/resource-collections/climate/climate-change-impacts#:~:text=The%20impacts%20of%20climate%20change%20on%20different%20sectors%20of%20society,availability%2C%20and%20limit%20worker%20productivity>

This resource discusses the effects of climate change on ecosystems and the complexity it is causing.

Holcombe, R. M. (2022, March 9). *Welcome to NatureYear!* Common Ground- High School, Urban Farm and Environmental Education Center. <https://commongroundct.org/2018/03/welcome-to-natureyear/>

This resource provides information about the NatureYear program offered at Common Ground High School in New Haven, Connecticut.

Kuo, Ming. (2019, June 7). "Six Ways Nature Helps Children Learn." Greater Good Magazine: Science Based Insights For a Meaningful Life. [https://greatergood.berkeley.edu/article/item/six\\_ways\\_nature\\_helps\\_children\\_learn](https://greatergood.berkeley.edu/article/item/six_ways_nature_helps_children_learn)

Ming Kuo researched and discovered six ways nature helps children learn and do better in school. These six ways include restoring children's attention, relieving stress, developing more self-discipline, making them more engaged and interested, increasing physical fitness and promote social connection and creativity.

Laws, J., Tan, A., & Lygren, E. (2020). "Sit Spots." In *How to Teach Nature Journaling: Curiosity, wonder, attention* (pp. 154-157). essay, Heyday. <https://howtoteachnaturejournaling.com/wp-content/uploads/2020/07/Sit-Spot-H2TNJ.pdf>

This chapter gives insight to sit spots while writing and how it can change the journaling experience for young writers.

Lewis, G. (2017). *Nature Writing Tips for Children from Award-Winning Author Gill Lewis*. YouTube. YouTube. <https://www.youtube.com/watch?v=Ff8jdk8zECE>

This short video clip has author, Gill Lewis, explain how she uses nature and her five senses when writing her books about nature.

National Geographic Society. (2022, June). *All About Climate*. National Geographic Society. <https://education.nationalgeographic.org/resource/all-about-climate>

This resource discusses the climate classification system created by Russian-German scientist Wladimir Köppen. It also explains how climate influences humans, plants and animals.

National Geographic Society. (2022, May 20). *Drought*. National Geographic Society. National Geographic Society. <https://education.nationalgeographic.org/resource/drought>

This resource discusses how below-average precipitation affects the amount of moisture in soil as well as the amount of water in streams, rivers, lakes, and groundwater.

National Geographic Society. (2022, May 20). *Köppen Climate Classification System*. National Geographic Society. <https://education.nationalgeographic.org/resource/koppen-climate-classification-system>

This resource takes a deeper look into the *Köppen Climate Classification System*.

Rillero, P. (1999). "Haiku and Science- Observing, Reflecting and Writing About Nature." *Journal of College Science Teaching*;5(28), 345–347. file:///Users/michelleromanelli/Desktop/ovserving%20nature.pdf

This article describes how students observed nature and wrote poems after reflecting on their observations.

Robbins, J. (2020, January 16). *Regularly immersing yourself in nature can help health and Wellbeing*. UrbanUW.

<https://urban.uw.edu/news/regularly-immersing-yourself-in-nature-canhelphealthandwellbeing/#:~:text=In%20a%20study%20of%2020%2C000,several%20visits%20%E2%80%94%20were%20substantially%20more>

This study that proved that regularly immersing yourself in nature can help a human's health and well-being.

Stone, R. C., & Meinke, H. (2006). "Weather, climate, and Farmers: An overview." *Meteorological Applications*, 13(S1), 7–20. <https://doi.org/10.1017/s1350482706002519>

This journal discusses how weather and climate are impacting farmers and their decision making when it comes to their crops and managing their farm.

Strich, D. (2013, April 5). "Reflective Sit Spots." *Green Teacher 95: Education for Planet Earth*, 22–24. <https://www.deceptionpassfoundation.org/wp-content/uploads/Reflective-Sit-Spots.pdf>

This article explains how sit spots can be practiced in non-formal education settings and standard school settings. It shows how connecting with nature can increase scientific inquiry, personal growth and reflection among young children to young adults.

Walsh, J. E., Ballinger, T. J., Euskirchen, E. S., Hanna, E., Mård, J., Overland, J. E., Tangen, H., & Vihma, T. (2020). "Extreme weather and climate events in Northern Areas: A Review." *Earth-Science Reviews*, 209.

<https://doi.org/10.1016/j.earscirev.2020.103324>

This resource surveys work on various types of extreme events in northern high latitudes, addressing the evidence and changes occurring due to climate.

*Weather Systems and patterns*. National Oceanic and Atmospheric Administration. (2011, February 1). <https://www.noaa.gov/education/resource-collections/weather-atmosphere/weathersystemspatterns#:~:text=They%20can%20be%20indirectly%20observed,warm%20air%20replaces%20cold%20air>

This resource describes how the local weather that impacts our daily lives results from large global patterns in the atmosphere caused by the interactions of solar radiation, Earth's large ocean, diverse landscapes, and motion in space.

Wilson, C. (2011, June). *Effective Approaches to Connect Children With Nature*. Retrieved from <https://www.doc.govt.nz/globalassets/documents/getting-involved/students-and-teachers/effective-approaches-to-connect-children-with-nature.pdf>

This resource emphasizes the importance of children connecting with nature by developing conservation knowledge, values and skill to make a difference.

## Appendix on Implementing District Standards

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This unit is designed to incorporate the Common Core State Standards and 21st century skills which will prepare our students for their future.

### SCIENCE (NGSS)

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

Students will observe climate and weather in their home towns, at school and in different regions of the world. They will take the data they find to determine what weather correlates with a specific climate zone.

**3-ESS2-1** Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. Examples of data could include average temperature, precipitation, and wind direction. Assessment of graphical displays is limited to pictographs and bar graphs.

Students will report weather data by looking at the weather report in their area, going outside to experience how the weather feels and jot their observations down in their weather journals. As a class, students will keep track of the weather by collecting data and comparing weather patterns.

### LITERACY

**CCSS.ELA-LITERACY.RI.3.1** Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

Students will be able to ask and answer questions daily throughout this unit in regards to weather and how it

impacts a particular area or climate zone. They will take part in several field trips and experiments to get hands on experiences while exploring these topics.

CCSS.ELA-LITERACY.W.4.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

Students will be able to use their prior knowledge and new information they learned about to create informational writing on a particular climate zone. They will be able to use information found from texts, websites, books and online videos to support their ideas clearly.

## **SPEAKING & LISTENING**

CCSS. ELA-LITERACY.SL.3.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 3 topics and texts*, building on others' ideas and expressing their own clearly.

This will be implemented in every lesson so students have the opportunity to share their thoughts and ideas with different classmates to learn from one another.

CCSS. ELA-LITERACY.SL.3.1.C Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others.

Students will pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others. Setting up a question spot or a “parking lot” poster where students can write their questions on sticky notes and post on a poster is a great way to collect data on what the students are having trouble understanding. This will make it easier for the teacher to provide additional lessons or resources to students to clarify any questions they might have.

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