



Climate and Weather Conditions:

Third Grade

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NVACS – 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.
* 3-ESS3-1: Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

Math:

* 3.MD.A.2: Measure and estimate liquid volumes and masses of objects using standard units of grams, kilograms, and liters. Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.
* 3.MD.B.3: Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in bar graphs.

Engineering:

* 3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
* 3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
* 3-5-ETS1-3: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Literacy:

* RI.3.1: Ask and answer questions to demonstrate the understanding of a text, referring explicitly to the text as the basis for the answers.
* RI.3.7: Use information gained from illustrations (e.g., maps, photographs) and words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur.)
* RI.3.9: Compare and contrast the most important points and key details presented in two texts on the same topic.
* W.3.7: Conduct short research projects that build knowledge about a topic.
* W.3.8: Recall information from experiences or gather information from print and digital sources: take brief notes on sources and sort evidence into provided categories.
* SL.3.4: Recount on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.
* SL.3.6: Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification.

Materials

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Item** | **Qty.** |  | **Item** | **Qty.** |
| Computer and iPad | 1 |  | BrainPOP jr. Login | |
| Science Notebooks | Class set (30) |  | Computers or tablets for class use (optional) | Class set (30) |
| Thermometers | Class set (30) |  | Wide mouthed glass jar | 5 |
| Balloon | 5 |  | Rubber bands | 2 bags |
| Scissors | Class set (30) |  | Drinking straw | 3 Class sets (90) |
| Cardboard strips | Class set (30) |  | Glue | Class set (30) |
| Rulers | Class set (30) |  | Pens | Class set (30) |
| Modeling clay | 1 lb. |  | Empty shoe box | 5 |
| Empty 2-liter plastic bottles | 5 |  | Clean marbles/pebbles | 1 lb. |
| Masking tape | 3 rolls |  | Permanent markers/Sharpies | 5 |
| Spray water bottle | 5 |  | Small paper cups | 2 Class sets (60) |
| Hole punch | 5 |  | Duct tape | 3 rolls |
| Thin wooden dowels | 15 |  | Empty water bottle | 5 |
| Stopwatch | 1 |  | Paper plates | 10 |
| Poster board | 5 |  | Straight pins | 1 package |
| Compass | 5 |  | Crayons | Class set (30) |
| Paper | 1 ream |  | Rubber gloves | Class set (30) |
| Plastic forks | Class set (30) |  | Tin foil | 6 rolls |
| Styrofoam plates | Class set (30) |  | Wool | 1 yard |
| 40 quart plastic container | 6 |  | Toilet paper rolls | 2 Class sets (60) |
| Sandwich sized plastic bags | 2 boxes |  | Foam piping (3/8” by ¾”) | 6 ft. |
| ¼ sized measuring cup | 6 |  | Sand | 5 lbs. |
| Cotton balls | 1 bag |  | Craft sticks | 2 boxes |
| Globe | 1 |  | Individual world maps | Class set (30) |
| Pencils | Class set (30) |  | Graph paper | 1 ream |
| Colored pencils | Class set (30) |  | Hair dryer | 5 |
| Cardboard tube | Class set (30) |  | Construction paper | 1 ream |
| Pipe cleaners | Class set (30) |  | Paper towel tube | Class set (30) |
| Index cards | Class set (30) |  |  |  |

Books

(with myON links, if available)

The Science Behind Weather by Darlene Stille, or use the myON link: <https://www.myon.com/reader/index.html?a=tscbh_wther_s12>

Air: Outside, Inside, and All Around by Darlene Stille, or use the myON link: <https://www.myon.com/reader/index.html?a=as_air_s04>

The Wettest Places on Earth by Martha Rustad, or use the myOn link: <https://www.myon.com/reader/index.html?a=expl_wette_s10>

Gusts and Gales: A Book About Wind by Josepha Sherman, or use the myON link: <https://www.myon.com/reader/index.html?a=we_ggales_f03>

Temperature Heating Up and Cooling Down by Darlene Stille, or use myON link: <https://www.myon.com/reader/index.html?a=as_tempe_s04>

The Pool Party by Marcie Aboff, or use the myON link: <https://www.myon.com/reader/index.html?a=kr_pool_s08>

Nature’s Fireworks: A Book About Lightning by Josepha Sherman, or use the myON link: <https://www.myon.com/reader/index.html?a=we_nfireworks_f03>

Eye of the Storm: A Book About Hurricanes by Rick Thomas, or use the myON link: <https://www.myon.com/reader/index.html?a=as_hurri_s05>

Zoom In on Climate Maps by Kathy Furgang (no myON)

Climate (Science Readers: Content and Literacy) by Teacher Created Materials (no myON)

Tropical Climates by Cath Senker, <https://www.myon.com/reader/index.html?a=fcz_trop_s17>

Temperate Climates by Cath Senker, <https://www.myon.com/reader/index.html?a=fcz_temp_s17>

Polar Climates by Cath Senker, <https://www.myon.com/reader/index.html?a=fcz_polar_s17>

Desert Climates by Cath Senker, <https://www.myon.com/reader/index.html?a=fcz_desert_s17>

Vocabulary

|  |  |
| --- | --- |
| **Word** | **Definition** |
| Air Pressure | The weight of air above a given area on the Earth’s surface |
| Anemometer | An instrument for measuring the force or speed of the wind |
| Arid Zone | Dry and hot all year |
| Atmosphere | The whole mass of air surrounding the earth |
| Barometer | An instrument that measures the pressure of the atmosphere to determine probable weather changes |
| Climate | A region with specified weather conditions |
| Climograph | A graphical representation of basic climatic parameters that is monthly average temperature and precipitation at a certain location |
| Condense | To change from a less dense to a denser form (steam condenses into water) |
| Density | The quality or state of having a high mass per unit volume |
| Drought | A long period of dry weather |
| Electrons | A particle that has a negative charge of electricity |
| Extreme Heat | Existing to a very great degree/a condition of being hot |
| Flash Flooding | Sudden flooding that occurs when floodwaters rise rapidly within several hours of an intense rain |
| Forecast | To calculate or predict, usually by study and examination of data |
| Hail | Small lumps of ice that fall from clouds sometimes during thunderstorms |
| Heat Wave | A period of unusually hot weather |
| Highland Zone | Climate of land in high mountain areas |
| Humidity | The amount of moisture in the air |
| Hurricane | A cyclone formed in the tropics with winds of 74 mph or greater that is usually accompanied by rain, thunder, and lightning |
| Levee | A barrier constructed to contain the flow of water |
| Mediterranean | Mild winters; hot, dry summers |
| Meteorologist | A person who studies the science that deals with atmosphere and weather |
| Moisture | A small amount of liquid that causes something to be slightly wet |
| Polar Zone | The part of the Earth’s surface forming a cap over a pole, characterized by frigid climate |
| Precipitation | Water that falls to the earth as hail, mist, rain, sleet, or snow |
| Rain Gauge | A device that measures liquid precipitation (rain) as opposed to solid precipitation (snow) over a set period of time |
| Relative Humidity | How much water vapor is in the air compared to how much it could hold at that temperature |
| Satellites | A man-made object which orbits the Earth and gives information about weather |
| Static Electricity | Electricity that consists of isolated, stationary charges |
| Storm Surge | A rise in sea level that occurs during intense storms |
| Temperate Zone | The area or region between the Tropic of Cancer and the arctic circle or the Tropic of Capricorn and the Antarctic circle |
| Temperature | The degree of hotness or coldness of something |
| Thermometer | An instrument for measuring temperature |
| Tornado | A violent destructive whirling wind accompanied by a funnel-shaped cloud |
| Tropical Zone | The area or region between the Tropic of Cancer and the Tropic of Capricorn |
| Weather | The state of the atmosphere in regard to heat or cold |
| Weather Balloon | An instrument carried by a balloon to send back information on atmospheric temperature, pressure, and humidity with a transmitter |
| Wind Vane | A device that measures the direction of the wind |

Lesson 1: What is weather?

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| **Learning Target**  **Objective**  **Standard** | Weather is the condition of the atmosphere from day to day.  Students will understand that weather is based on certain conditions in the atmosphere.  3-ESS2-1: Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. |
| **Materials** | Computer, chart paper or white board, white board markers, science notebooks, pencils, thermometers |
| **Books** | The Science Behind Weather by Darlene Stille |
| **Vocabulary** | Weather: The daily state of the atmosphere, or air, in any given place  Precipitation: Water that falls to the earth as hail, mist, rain, sleet, or snow  Temperature: The degree of hotness or coldness of something  Atmosphere: The layer of gas that surrounds the Earth  Climate: Average weather in a place over many years |
| **Procedures** | **ENGAGE**  Video: “Seasons and the Sun: Crash Course Kids 11.1” (3:56): <https://www.youtube.com/watch?v=b25g4nZTHvM>  Ask: What is weather? As a class, make a KWL chart. Students should list everything they know or think they know about the weather, seasons, and climate, as well as everything they want to know. The KWL chart should be used throughout the unit.  Video: “Our World: What is Weather?” (3:13):  <https://www.youtube.com/watch?v=UtgFHHhm1xU&t=19s>  **EXPLORE**  Video: “Be a Weather Watcher” (3:58): <https://www.youtube.com/watch?v=Uo8lbeVVb4M>  In order for meteorologists to accurately predict the weather, they rely on data collection. Start a calendar with the class to record the daily weather throughout the unit. As students to write a paragraph based on the following question:  “Describe the summer weather in your city or state. Explain it as if you were sending an email to someone who lives far away. Include as many details as you can think of, including the temperature, the amount of precipitation, cloud cover, wind, and humidity.”  Once the student has finished writing, give them a few minutes to Mix-Pair-Share (<https://www.kaganonline.com/>) their paragraphs, and add any detail as necessary.  Each student should use a chart or a science notebook to track and record the weather on a daily basis. Make sure to go outside to record the weather at the same time every day for a minimum of a week. The weather can be recorded several times throughout the day depending on schedule, but should always be around the same time.  Using the thermometers, make sure the students record the temperature, as well as any and all observations that are made. Ask the students questions to get them looking at the weather: Is it sunny? Cloudy? Windy?  Once the observations are made outside, they can compare what they noticed to an official forecast on The Weather Channel website: <https://weather.com/> Compare the official weather to observations made. Add any details the weather channel has, including wind speed, humidity, pressure, and visibility.  Once the weather is recorded, use <https://weather.com/> to explore weather in other areas of the country. Try and find weather that is similar to what is recorded, and completely different. Use other cities in the United States. Some ideas might be Washington, DC; Seattle, WA; Juneau, AK; Tucson, AZ; Dallas, TX; and Denver, CO.  Fill out a chart as a class so the students can see how it should look in their science notebooks. Keep filling it out daily to show patterns in weather.  **EXPLAIN**  Book: The Science Behind Weather by Darlene Stille, or use the myON link: <https://www.myon.com/reader/index.html?a=tscbh_wther_s12>  Weather is what the forecasters on the TV news predict each day. They tell people about the temperature, cloudiness, humidity, and whether a storm is likely in the next few days. It is the mix of events that happens each day in our atmosphere. Weather is not the same everywhere. It may be hot and sunny in one part of the world, but freezing and snowy in another. |
| **Enrichment** | **EXTEND**  Once the 5 day observations are completed, ask students: What do you think the weather will be like on day 6? Why? Have the students explain their thinking. |
| **Closure** | **ELABORATE**  Meteorologists track weather for several reasons. It is important to keep records to discover any changes in the climate of a particular area. Tracking weather also assists with predicting extreme weather and helps to prepare people for any changes they may need to make, including evacuation or getting their house ready for outside forces.  Teacher’s note: Save the data collected from the observations to be used throughout the unit. |
| **Assessment** | Formative: Have each student use their own calendar to document the weather. Check for understanding during group brainstorming for the KWL chart. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss the idea of weather, forecasting and keeping track of the weather over a long period of time. Review the KWL chart and answer any clarification questions the student may have. | Discuss the idea of weather, forecasting and keeping track of the weather over a long period of time. Ask the student: Who benefits from tracking the weather? Why? | Discuss the idea of weather, forecasting and keeping track of the weather over a long period of time. Ask the student: Is there weather always predictable based on past data? Why or why not? |
| **ELL Strategies** | | |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student act out or draw the different ideas brainstormed in the KWL chart.  *Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the different types of weather recorded in different areas. Repeat the motions with them until they are able to tell you what they are.  *Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. | | |
| **DOK Question (Level 3)** | | |
| Ask students: How is tracking the weather related to forecasting the weather? Do you think it has any impact on how the weather is viewed? | | |
| **Interactive Technology** | | |
| App: School Bell Weather – Weather for Kids – Ladeez First Media  App: MarcoPolo Weather – The Weather Learning Game  Game: The Cat in the Hat Knows a Lot About That: “Weather Transformer”:<http://pbskids.org/catinthehat/games/weather-transformer>  Game: EduPlace/ Houghton Mifflin Company: “Discover! Looking at the Sky”:<http://www.eduplace.com/kids/hmsc/activities/simulations/grk/unitd.html> | | |

Lesson 2: How are different elements of the weather measured? (Air Pressure)

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| **Learning Target**  **Objective**  **Standard** | Weather is recorded at different times and across areas to help understand weather patterns so scientists can make predictions about what kind of weather might happen next.  Students will be able to identify the elements of weather and the instruments used to collect weather data. Students will create a weather instrument and identify its usage in weather data collection.  3-ESS2-1: Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. |
| **Materials** | Computer, chart paper or white board, white board markers, science notebooks, pencils, wide-mouthed glass jars or small coffee cans, balloons, rubber bands, scissors, drinking straws, cardboard strips, glue, rulers, pens, modeling clay, empty shoe boxes |
| **Books** | Air: Outside, Inside, and All Around by Darlene Stille |
| **Vocabulary** | Barometer: An instrument that is used to measure air pressure and predict changes in the weather  Atmosphere: The layer of gas that surrounds Earth  Air Pressure: The weight of air pushing down on the Earth |
| **Procedures** | **ENGAGE**  Video: “Kid Meteorologist” (1:28): <https://www.youtube.com/watch?v=PvZv3D8SKUA>  Discuss the different type of instruments that are used in order to be able to forecast the weather.  Barometer: measures atmospheric pressure  Rain gauge: measures the amount of precipitation in an area  Anemometer: measures wind speed  Wind vane: measures wind direction  Thermometer: measures temperature  By using the different instruments every day, meteorologists are able to not only track the weather, but predict the upcoming weather based on patterns seen in the sky and in the time of year. Scientists are also able to check for changes in climate.  Video: “How are weather forecasts made?” (3:06):  <https://www.youtube.com/watch?v=fdErsR8_NaU>  **EXPLORE**  Book: Air: Outside, Inside, and All Around by Darlene Stille, or use the myON link: <https://www.myon.com/reader/index.html?a=as_air_s04>  After going over the different instruments in the book, the students will be making their own weather instruments. Have the class Mix-Freeze-Group (<https://www.kaganonline.com/>) to create groups of 2-6 to create a barometer  Weather Scope: Make and Use a Barometer: <http://www.k12science.org/curriculum/weatherproj2/en/docs/barometer.shtml>  Cut the narrow opening of the balloon off. Cover the top of the jar with the balloon so that it is airtight and use the rubber band to hold it in place. Place a small amount of glue in the middle of the balloon and carefully place one end of the straw on the glue so that the other side extends over the edge of the jar. While the glue is drying, fold a piece of cardboard so it can stand on its own. Carefully mark lines .5 cm apart and write “Low Pressure” at the bottom and “High Pressure” at the top. Once completed, place the barometer and the scale inside the shoebox so that the end of the straw with the clay just reaches without touching the scale. Tape both the barometer and the scale into place so they cannot move. High pressure will make the balloon seal dip, causing the straw to go up. Low pressure will make the balloon puff up, causing the straw to go down. Make sure to put the barometer in a shaded location.  Video: “Bill Nye - Atmospheric Pressure” (5:34): <https://www.youtube.com/watch?v=QeAp3CuGjk8&t=28s>  **EXPLAIN**  Video: “What is Atmospheric Pressure - for kids” (3:39): <https://www.youtube.com/watch?v=o9lwghOHL5E>  Meteorologists use sophisticated versions of this equipment to forecast the weather, along with weather satellite images, radar, observations, and a knowledge of trends and patterns. Relatively accurate forecasts can be made up to seven days in advance.  Video: Easy Science for Kids: “What is a Barometer Facts for Kids Video” (1:46): <https://easyscienceforkids.com/what-is-a-barometer-facts-for-kids-video/>  A barometer is a scientific instrument used by meteorologists so they can keep track of air pressure. The word “barometer” is formed by combining two Greek words meaning “measuring weight.” This device is used to measure changes in pressure within the air so weather forecasts can be made. The barometer was invented in 1644 by an Italian mathematician named Evangelista Torricelli, who was a student of Galileo Galilei. He filled a glass tube with mercury, secured it at one end, and transposed it in a dish of mercury with its open end. Torricelli was not the one who named the device: in 1665 an Englishman named Robert Boyle came up with the term.  Video: “Washington Post: This new weather satellite…” (2:54): <https://www.washingtonpost.com/news/capital-weather-gang/wp/2016/11/19/u-s-launches-next-generation-weather-satellite-that-will-revolutionize-forecasting/?utm_term=.e48b9f2d36d0> |
| **Enrichment** | **EXTEND**  Using the different instruments, record the weather conditions for a week. Compare the homemade measurements to a local forecast, including wind speed, temperature, wind direction, air pressure, and precipitation. Add these observations in the science notebook from lesson 1.  Teacher’s note: Save the data collected from the observations to be used throughout the unit. |
| **Closure** | **ELABORATE**  People benefit from the work of meteorologists on a daily basis. Weather forecasts enable planning everything from clothing to activities that should be indoors or outdoors. When severe weather approaches, meteorologists have the incredibly important responsibility of telling people all they can so there is time to prepare. People may need to evacuate, board up their homes, or possibly permanently relocate to stay safe. |
| **Assessment** | **EVALUATE**  Formative: Have students describe the weather instrument they made, the purpose of it, and how it can be helpful to both meteorologists and the public. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss how knowing the air pressure would help to forecast the weather. Review how the instruments work, and why they are important to understand. | Discuss how knowing the air pressure would help to forecast the weather. Ask the student: Using the barometer, do you think weather forecasts are always correct? Why or why not? | Discuss how knowing the air pressure would help to forecast the weather. Ask the student: If you could only use a barometer to forecast the weather, would it work? Why or why not? |
| **ELL Strategies** | | |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student draw and explain the different kinds of weather instruments.  *Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the different types of weather instruments. Repeat the motions with them until they are able to tell you what they are.  *Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. | | |
| **DOK Question (Level 3)** | | |
| Ask students: Can you elaborate on why so many different instruments are used to measure the weather? If one of them wasn’t working properly, what would happen? | | |
| **Interactive Technology** | | |
| App: Free Barometer – Atmospheric and Air Pressure – Margaret kovatch  App: Air Pressure Free – Piet Jonas  App: Barometer GPS – current barometric pressure – Sun Dong Chen  Easy Science for Kids: Fun Barometers Quiz: <https://easyscienceforkids.com/fun-barometers-quiz-free-online-interactive-science-quiz/>  Tree House Weather Kids: Under An Ocean of Air Pressure: <https://extension.illinois.edu/treehouse/airpressure.cfm?Slide=1> | | |

Lesson 3: How are different elements of the weather measured? (Precipitation)

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| --- | --- |
| **Learning Target**  **Objective**  **Standard** | Weather is recorded at different times and across areas to help understand weather patterns so scientists can make predictions about what kind of weather might happen next.  Students will be able to identify the elements of weather and the instruments used to collect weather data. Students will create a weather instrument and identify its usage in weather data collection.  3-ESS2-1: Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. |
| **Materials** | Computer, chart paper or white board, white board markers, science notebooks, pencils,  empty 2-liter plastic bottles, scissors, clean marbles or pebbles, masking tape, water, rulers, permanent markers, water, spray water bottles |
| **Books** | The Wettest Places on Earth by Martha Rustad |
| **Vocabulary** | Precipitation: The liquid and solid water particles that fall from clouds and reach the ground; including drizzle, rain, show, snow pellets, ice crystals, and hail  Rain Gauge: A device that measures liquid precipitation (rain) as opposed to solid precipitation (snow gauge) over a set period of time |
| **Procedures** | **ENGAGE**  Video: “What is precipitation?” (6:10): <https://www.youtube.com/watch?v=SesRrocIFtc>  Review the different type of instruments that are used in order to be able to forecast the weather.  Barometer: measures atmospheric pressure  Rain gauge: measures the amount of precipitation in an area  Anemometer: measures wind speed  Wind vane: measures wind direction  Thermometer: measures temperature  By using the different instruments every day, meteorologists are able to not only track the weather, but predict the upcoming weather based on patterns seen in the sky and in the time of year. Scientists are also able to check for changes in climate.  Measuring rain is one method scientists use to learn more about and predict the weather. A rain gauge measures how much rain falls during a storm.  **EXPLORE**  Book: The Wettest Places on Earth by Martha Rustad, or use the myOn link: <https://www.myon.com/reader/index.html?a=expl_wette_s10>  Have the class Mix-Freeze-Group (<https://www.kaganonline.com/>) to create groups of 2-6 to create a rain gauge.  Education.com: Science Project: DIY Rain Gauge: <https://www.education.com/science-fair/article/DIY-rain-gauge/>  Use the scissors to cut off the top of the 2-liter bottle at the wide part, just below where it begins to get narrow. Put the marbles/pebbles at the bottom of the bottle: these will help keep it from getting blown over. Turn the top of the bottle upside down to act like a funnel. Place it at the bottom part of the bottle, pointing downward. Line up the cut edges and tape them together so the top part is held firmly in place. Use a long piece of tape to make a straight vertical line from the top edge of the bottle to the bottom. Use a marker to draw a line on the vertical piece of tape just a little above the top of the pebbles. This will be the bottom of the rain gauge. Set the ruler against the vertical tape so that the “0” lines up with the bottom mark. Use the marker to mark every quarter-inch along the piece of tape. Then label the inches from bottom to top. Set the bottle on a level surface and pour some water in until it reaches the bottom mark.  Certain areas get more rain than others. To demonstrate how a rain gauge works, spray some water above the gauge with the spray bottle. Note how even though the rain doesn’t directly fall into the bottle, the funnel design catches the rain and shows the measurement.  **EXPLAIN**  Meteorologists use sophisticated versions of this equipment to forecast the weather, along with weather satellite images, radar, observations, and a knowledge of trends and patterns. Relatively accurate forecasts can be made up to seven days in advance.  There are several different types of rain gauges. A standard rain gauge has a graduated cylinder, or a cylinder with measurement marks on the side and a funnel on top. When rain falls, it goes into the funnel and collects in the graduated cylinder. Some rain gauges have two cylinders: a smaller cylinder inside of a larger cylinder. This way, if the small cylinder fills up, the extra rain will collect in the large cylinder and provide an accurate measurement of the total rainfall.  Video: “Learn How to Measure Rainfall” (4:43): <https://www.youtube.com/watch?v=WyMabcRzUcw>  There are other types of rain gauges as well. For example, an optical rain gauge uses light beams to determine how much rain has fallen and how quickly. As the rain hits the light beam, the machine is able to determine how much rain is falling through the beam and how quickly it is falling.  A tipping bucket rain gauge has a funnel with a seesaw-like spout. As a rain drop goes down the funnel, it falls on one side of the seesaw and into the container. The next rain drop then falls on the other side of the seesaw. By counting the number of times the seesaw moves back and forth, a person or machine can determine the amount of rain and how fast it is falling. |
| **Enrichment** | **EXTEND**  Think about the other types of rain gauges. How would you make a tipping bucket rain gauge? See if you can create a design for it. |
| **Closure** | **ELABORATE**  People benefit from the work of meteorologists on a daily basis. Weather forecasts enable planning everything from clothing to activities that should be indoors or outdoors. When severe weather approaches, meteorologists have the incredibly important responsibility of telling people all they can so there is time to prepare. People may need to evacuate, board up their homes, or possibly permanently relocate to stay safe. |
| **Assessment** | **EVALUATE**  Formative: Have students describe the rain gauge they made, the purpose of it, and how it can be helpful to both meteorologists and the public. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss how knowing how much rain has fallen in a given area helps predict the weather in the future and helps to know at the current time. Review how the instruments work, and why they are important to understand. | Discuss how knowing how much rain has fallen in a given area helps predict the weather in the future and helps to know at the current time. Ask the student: Why would one type of rain gauge be beneficial over another? | Discuss how knowing how much rain has fallen in a given area helps predict the weather in the future and helps to know at the current time. Ask the student: How many rain gauges should be used in a given area? Why? |
| **ELL Strategies** | | |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student draw and explain the different kinds of rain gauges.  *Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the different types of rain gauges. Repeat the motions with them until they are able to tell you what they are.  *Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. | | |
| **DOK Question (Level 3)** | | |
| Ask students: Can you elaborate on why so many different instruments are used to measure the weather? If one of them wasn’t working properly, what would happen? | | |
| **Interactive Technology** | | |
| App: Pocket Rain Gauge - Agrible  Oddizzi: Precipitation: <http://www.oddizzi.com/teachers/explore-the-world/weather/weather-types/precipitation/>  Science Kids: Weather Facts: Rain Facts for Kids: <http://www.sciencekids.co.nz/sciencefacts/weather/rain.html> | | |

Lesson 4: How are different elements of the weather measured? (Wind Speed)

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| **Learning Target**  **Objective**  **Standard** | Weather is recorded at different times and across areas to help understand weather patterns so scientists can make predictions about what kind of weather might happen next.  Students will be able to identify the elements of weather and the instruments used to collect weather data. Students will create a weather instrument and identify its usage in weather data collection.  3-ESS2-1: Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. |
| **Materials** | Computer, chart paper or white board, white board markers, science notebooks, pencils, small paper cups, hole punches, scissors, duct tape, thin wooden dowels, empty water bottles, stopwatches, pebbles or marbles, fan |
| **Books** | Gusts and Gales: A Book About Wind by Josepha Sherman |
| **Vocabulary** | Anemometer: An instrument for measuring and indicating the force or speed and sometimes direction of the wind |
| **Procedures** | **ENGAGE**  Video: “Bill Nye the Science Guy on Wind (Full Clip)” (1:53): <https://www.youtube.com/watch?v=uBqohRu2RRk>  Discuss the different type of instruments that are used in order to be able to forecast the weather.  Barometer: measures atmospheric pressure  Rain gauge: measures the amount of precipitation in an area  Anemometer: measures wind speed  Wind vane: measures wind direction  Thermometer: measures temperature  By using the different instruments every day, meteorologists are able to not only track the weather, but predict the upcoming weather based on patterns seen in the sky and in the time of year. Scientists are also able to check for changes in climate.  **EXPLORE**  Book: Gusts and Gales: A Book About Wind by Josepha Sherman, or use the myON link: <https://www.myon.com/reader/index.html?a=we_ggales_f03>  Have the class Mix-Freeze-Group (<https://www.kaganonline.com/>) to create groups of 2-6 to create the different weather instruments.  Education.com: Science Project: How to Make an Anemometer: <https://www.education.com/science-fair/article/make-anemometer/>  Use the hole punch to make a hole in the side of each of the 4 paper cups. Use the hole punch to make 4 holes spaced evenly around the rum of the last cup. This will be the center of the anemometer. Slide 2 of the wooden dowels through the holes in the center cup. They should cross into an “X.” Insert the ends of the dowels into the holes of the other cups and tape them into place. Make sure the cups are all facing the same direction. Take the last wooden dowel and make a hole in the bottom of the center cup. Push the dowel up until it meets the X and tape everything together. This will be your rotation axis. Put some marbles or pebbles into the bottom of the water bottle to keep it from tipping over. Push the center dowel into the water bottle.  To calibrate the anemometer: On a windless day, have an adult drive their child (a student) down the street at 10 miles per hour. The student should hold the anemometer out the window and count the number of rotations in 30 seconds. However, many times the anemometer spins in 30 seconds will correspond roughly to wind blowing at 10 miles per hour.  **EXPLAIN**  Different wind speed meters (“anemometers”) work differently. The most simple type of anemometer is a rotating cup anemometer which works pretty much how you’d expect. It typically features two or three or four wind cups and it spins in the direction that the wind is blowing. By counting the number of rotations in a minute, we can calculate the speed of the wind.  Other anemometers use wind blades inside a fan type enclosure (these are often called vane anemometers). Still other anemometers measure the speed of the wind by calculating how long it takes to cool down a heated wire (unsurprisingly these are called hot wire anemometers). Another advanced type of anemometer is an ultrasonic anemometer which measures how fast sound pulses move through air. A [wind sock](https://www.amazon.com/Airport-Windsock-Rip-stop-Measurement-Reflective/dp/B01L138HXG/ref=as_li_ss_tl?s=lawn-garden&ie=UTF8&qid=1524587645&sr=1-4&keywords=wind+sock&linkCode=ll1&tag=windandweathertools-20&linkId=f4aa4d917df072e757f154195a39100d) isn’t quite an anemometer but it is another simple method of roughly measuring wind speed and direction. |
| **Enrichment** | **EXTEND**  Using the anemometer, measure the wind speed of a few different fans. Students can also fold their own fans to try and see the difference in wind speed between an electric fan and a regular fan. |
| **Closure** | **ELABORATE**  Wind speed and direction are important for monitoring and predicting weather patterns and global climate. Wind speed and direction also have numerous impacts on surface water, which affect the rates of evaporation and the development of storm surges. |
| **Assessment** | **EVALUATE**  Formative: Have students describe the weather instrument they made, the purpose of it, and how it can be helpful to both meteorologists and the public. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss the anemometer, its function, and its purpose for the public and for meteorologists. Review how the instruments work, and why they are important to understand. | Discuss the anemometer, its function, and its purpose for the public and for meteorologists. Ask the student: What are the benefits to knowing the wind speed? What about the wind direction? | Discuss the anemometer, its function, and its purpose for the public and for meteorologists. Ask the student: What types of weather could be monitored with an anemometer? Could it predict it happening again? Why or why not? |
| **ELL Strategies** | | |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student draw and explain an anemometer.  *Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the different types of weather instruments. Repeat the motions with them until they are able to tell you what they are.  *Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. | | |
| **DOK Question (Level 3)** | | |
| Ask students: Can you elaborate on why there are several types of anemometers? What could be used if it stopped working properly? | | |
| **Interactive Technology** | | |
| App: Wind Speed Meter – Anemometer  App: Windy Marine – Miha Korosec  App: BreezeView Pad – Etesian Technologies LLC  BrainPOP: Wind Simulator: <https://www.brainpop.com/games/windsimulator/> | | |

Lesson 5: How are different elements of the weather measured? (Wind Direction)

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| **Learning Target**  **Objective**  **Standard** | Weather is recorded at different times and across areas to help understand weather patterns so scientists can make predictions about what kind of weather might happen next.  Students will be able to identify the elements of weather and the instruments used to collect weather data. Students will create a weather instrument and identify its usage in weather data collection.  3-ESS2-1: Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. |
| **Materials** | Computer, chart paper or white board, white board markers, science notebooks, pencils, paper plates, scissors, poster board or card stock, plastic straws, straight pins, pencil with new erasers, modeling clay, glue, compasses, rulers  Optional: construction paper, markers or crayons, glue, staples, tissue paper, tape, hole punch, string |
| **Books** | Gusts and Gales: A Book About Wind by Josepha Sherman |
| **Vocabulary** | Wind Vane: A device that measures the direction of the wind  Windsock: A cloth mounted on a mast |
| **Procedures** | **ENGAGE**  Video: “Wind direction and speed” (2:09): <https://www.youtube.com/watch?v=SqbTrbxWT1o>  Discuss the different type of instruments that are used in order to be able to forecast the weather.  Barometer: measures atmospheric pressure  Rain gauge: measures the amount of precipitation in an area  Anemometer: measures wind speed  Wind vane: measures wind direction  Thermometer: measures temperature  By using the different instruments every day, meteorologists are able to not only track the weather, but predict the upcoming weather based on patterns seen in the sky and in the time of year. Scientists are also able to check for changes in climate.  **EXPLORE**  Book: Gusts and Gales: A Book About Wind by Josepha Sherman, or use the myON link: <https://www.myon.com/reader/index.html?a=we_ggales_f03>  Have the class Mix-Freeze-Group (<https://www.kaganonline.com/>) to create groups of 2-6 to create the different weather instruments.  Video: “How to Make a Wind Vane” (2:03): <https://www.youtube.com/watch?v=cnZ5LYI19Vo>  Write the 4 directions: north, east, west, and south equally spaced on an inverted paper plate. Use scissors to cut an arrow point and an arrow tail from the poster board or cardstock, making each about 2” long. Make small slits at each end of the straw using scissors. Place one of the poster board arrow shapes into a slit at each end of the straw to create an arrow. This will later point to the direction the wind is blowing. Insert a straight pin through the center of the straw, and then into the eraser tip of the pencil, making sure to leave ample space for spinning at the upper and lower sides of the straw. Set the pencil by pushing its point through the center of the paper plate, and then sticking it into a lump of modeling clay serving as a base. Test the wind vane by gently blowing it. Place the structure on a second paper plate, and then glue the plates together with the clay mound inside. Move the wind vane outdoors after the glue dries, and then align the directions using the compass. The arrow will point in the direction the wind is blowing.  **EXPLAIN**  Wind direction is measured by a wind vane that aligns itself with the direction of the wind. Wind direction is typically reported in degrees, and describes the direction from which the wind emanates. A direction of 0 degrees is due North on a compass, and 180 degree is due South. A direction of 270 degrees would indicate a wind blowing in from the west.  Knowing where the wind is coming from gives important insight into what kind of temperatures to expect. Wind direction is one of the first things a meteorologist looks at when forecasting the weather. The temperatures can change if the wind blows off of the ocean, down from Canada, or up from the Gulf of Mexico. For example, more than 50% of the ground is snow covered in eastern Canada from late November to mid-April on average. As a result, winds blowing over the deep Canadian snow pack become even colder and often keep these chilly characteristics traveling even further south. |
| **Enrichment** | **EXTEND**  Another way to measure wind direction would be with a windsock.  wikiHow: How to Make a Windsock for Children: <https://www.wikihow.com/Make-a-Windsock-for-Children>  Materials: Sheet of construction paper, markers or crayons, glue, staples, tissue paper, tape, hole punch, and string.  Have students decorate a sheet of construction paper with crayons or markers. Roll the paper widthwise into a tube; then glue or staple it shut. Bring the narrow ends of the paper together to form a tube. Overlap them by 1 inch. Make sure the side that is decorated is on the outside of the tube. Cut the tissue paper into streamers of about 15 inches long and 1-2 inches wide. Cut enough strips to glue all around the inside edge of the windsock, usually about 5-10 strips. Tape or glue the streamers to the inside bottom edge of the windsock. Place the first streamer into the windsock by 1 inch, then move on to the next streamer. Keep going until the entire inside is covered with streamers. Punch two holes in the top of the windsock, directly across from each other. Cut a piece of string that is 3-4 times the width of the windsock. Thread a piece of string through both holes, then tie the ends together. Rotate the handle so the knot is inside the windsock. Hang the windsock from a hook, or hold it up in front of a fan. |
| **Closure** | **ELABORATE**  Wind direction is described by using the direction that the wind came from. For example, a southerly wind would blow from the south to the north. Wind direction is measured a number of ways including weather or wind vanes, flags, and windsocks. |
| **Assessment** | **EVALUATE**  Formative: Have students describe the weather instrument they made, the purpose of it, and how it can be helpful to both meteorologists and the public. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss the methods of determining wind direction; including a wind vane and windsock, and how they can help with weather prediction. Review how the instruments work, and why they are important to understand. | Discuss the methods of determining wind direction; including a wind vane and windsock, and how they can help with weather prediction. Ask the student: Which one of the wind instruments is the best at telling wind direction? Why? | Discuss the methods of determining wind direction; including a wind vane and windsock, and how they can help with weather prediction. Ask the student: Why do you think wind coming from different parts of the country change the temperature? |
| **ELL Strategies** | | |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student draw and explain the different kinds of wind direction instruments.  *Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the different types of wind direction instruments. Repeat the motions with them until they are able to tell you what they are.  *Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. | | |
| **DOK Question (Level 3)** | | |
| Ask students: Can you elaborate on why there is more than one type of instrument for wind direction? Why would you need multiple items? | | |
| **Interactive Technology** | | |
| App: Barometer & Altimeter Pro – Steffen Bauereiss  App: Barometer Plus – Altimeter – Advance Barometer  BBC Schools: Wind Direction: <http://www.bbc.co.uk/schools/whatisweather/aboutweather/winddir.shtml> | | |

Lesson 6: How are different elements of the weather measured? (Temperature)

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| **Learning Target**  **Objective**  **Standard** | Weather is the day-to-day conditions of a particular place, and is measured by different tools.  Students will understand that several tools are used to measure the weather.  3-ESS2-1: Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. |
| **Materials** | Computer, BrainPOP jr. login, individual white boards, white board markers, science notebooks, thermometer, class/group set of: glass bottles, rubbing alcohol, water, plastic measuring cups, funnels, food coloring, modeling clay, clear straws, ice |
| **Books** | Temperature Heating Up and Cooling Down by Darlene Stille  The Pool Party by Marcie Aboff |
| **Vocabulary** | Thermometer: An instrument for measuring temperature  Mercury: The liquid in a thermometer that shows the air’s temperature  Temperature: The degree of hotness or coldness that can be measured using a thermometer |
| **Procedures** | **ENGAGE**  Ask the students: When you are trying to find out the weather, what kinds of tools do you use? Have students StandUp-HandUp-PairUp (<https://www.kaganonline.com/>) to find a partner for discussion to discuss the different tools they may use for the weather. Students may discuss different types of weather, such as warm or cold. Ask the students: How do you know how warm or cold it is?  Book: Temperature Heating Up and Cooling Down by Darlene Stille, or use myON link: <https://www.myon.com/reader/index.html?a=as_tempe_s04>  **EXPLORE**  Video: BrainPOP jr.: “Temperature” (4:46): <https://jr.brainpop.com/math/measurement/temperature/>  Tell the students: A thermometer measures how hot or cold something is. Ask: How do you think a thermometer is made? Give students a few minutes to discuss before giving them the supplies and instructions.  PBS Parents - DIY Bottle Thermometer: <http://www.pbs.org/parents/adventures-in-learning/2014/09/diy-bottle-thermometer/>  Have the class Mix-Freeze-Group (<https://www.kaganonline.com/>) to create groups of 4-6 depending on the class size. Each group will need: an empty glass bottle, a funnel, food coloring, modeling clay, a clear straw, ice, ½ cup of rubbing alcohol, and ½ cup of water.  Using the funnel, students should pour the water into the glass bottle. Pour the rubbing alcohol into the bottle. Add a few drops of food coloring. Mix by swirling the bottle around gently. Insert the straw into the bottle. Make sure it doesn’t fall or touch the bottom. Secure the straw with the modeling clay at the top of the bottle, making sure not to cover the top of the straw. Place the thermometer in the sun to see it in action, then place it on top of the ice cubes to see it cool back down.  Ask students to draw pictures of the thermometer as they test it: both when the temperature is warm, and when it is cold. Ask the students: What is the difference in the two pictures?  **EXPLAIN**  The temperature of something is a measure of hot or cold it is, usually measured with a thermometer. Discuss how a thermometer works: when the thermometer is measuring something warm or hot, the red liquid (mercury) in the thermometer goes up. When the thermometer is measuring something cool or cold, the red liquid in the thermometer goes down. In the experiment, as the temperature of the liquid in the bottle increases, it expands – or spreads out. The only place the liquid can go up is through the straw. If the temperature of the liquid decreases, it contracts or shrinks, the liquid expands when it gets warm, and moves up the straw. The liquid contracts when it gets cold and moves back down the straw.  Give the class a chance to explore the regular thermometer. With a Venn diagram, compare and contrast the two different versions of the thermometers. Ask the students: Which thermometer would you want to use if you were a meteorologist? Why? |
| **Enrichment** | **EXTEND**  Ask the students: When is it important to know the exact temperature outside? Is it only important for meteorologists? When would you use it at your home?  Book: The Pool Party by Marcie Aboff, or use the myON link: <https://www.myon.com/reader/index.html?a=kr_pool_s08> |
| **Closure** | **ELABORATE**  Discuss how a thermometer would help a meteorologist do their job. In order to make predictions accurately for the future, the meteorologist needs to know the exact temperature rather than if it is just hot or cold. |
| **Assessment** | **EVALUATE**  Formative: Ask the student to describe the purpose of a thermometer. Check for understanding during observation of the experiment. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss the idea of weather, and how a thermometer is used to measure temperature. Review the importance of knowing temperature. | Discuss the idea of weather, and how a thermometer is used to measure temperature. Ask the student: How does knowing what the weather is going to be help at home? | Discuss the idea of weather, and how a thermometer is used to measure temperature. Ask the student: Is the temperature likely to be similar tomorrow? Why or why not? |
| **ELL Strategies** | | |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student act out or draw the difference in a thermometer between measuring hot or cold temperatures.  *Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the different ways a thermometer works. Repeat the motions with them until they are able to tell you what they are.  *Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. | | |
| **DOK Question (Level 2)** | | |
| Ask students: What do you notice about the thermometer you made versus the one bought from the store? Do you think they both work the same way? | | |
| **Interactive Technology** | | |
| App: Digital Thermometer app – Current temperature&humidity  App: Thermometer++ - Viachaslau Tysianchuk  Game: PBS Kids: Sid the Science Kid: “Weather Surprise” <http://pbskids.org/sid/fablab_weathersurprise.html>  Interactive: Math is Fun: “The Interactive Thermometer” <https://www.mathsisfun.com/measure/thermometer.html> | | |

Lesson 7: How is weather data used to create a weather report?

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| **Learning Target**  **Objective**  **Standard** | Tables, along with various graphical displays (bar graphs, pie graphs, pictographs, and line graphs) can be used to show patterns over time.  Students will be able to create a weather report that includes components of weather in a particular season.  3-ESS2-1: Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.  3.MD.B.3: Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in bar graphs. |
| **Materials** | Computer, student computers or tablets, individual white boards, white board markers, science notebooks, paper, crayons |
| **Books** | The Science Behind Weather by Darlene Stille |
| **Vocabulary** | Forecast: A prediction about how something (as the weather) will develop |
| **Procedures** | **ENGAGE**  Video: “How Weather is Predicted” (1:06): <https://www.youtube.com/watch?v=AVpJd335VcI>  Video: “How a Weather Forecast is Made” (2:47): <https://www.youtube.com/watch?v=I_mvYJlypfo>  Ask students: How can we use the data collected and instruments we made to create a weather report? Review the components of a weather report. Discuss the patterns occurring in the weather data that might continue to the following week.  **EXPLORE**  Video: “How Forecasts Are Made” (3:13): <https://www.youtube.com/watch?v=NX3XVM2Ttp0>  Using a table, enter the weeks’ worth of data, including: date, time, temperature, wind direction, wind speed, rain gauge, and high or low pressure. Leave one column blank. Each student should fill out their own table, but have the same information. One can be filled out for the class as well. Have the class Mix-Freeze-Group (<https://www.kaganonline.com/>) to create groups of 2-6 (depending on the class size.)  Review some of the different types of graphs, including line graphs, pie charts, and bar graphs. For the data being tracked, the students will be making a line graph based on the 5 days that were tracked, as well as one of the components (temperature would be the easiest to graph.) Each group will create a line graph, either by hand, or using a website: Kids’ Zone: Create a Graph: <https://nces.ed.gov/nceskids/graphing/classic/line_chart.asp?temp=5280082>  Review how to label the X and Y axis, including inputting different points into the graph. Depending on the class, more than one component can be tracked, potentially on the same graph. Once each group has created a graph, their job is to analyze the data to predict the weather for the following day.  Each student will then create a weather report based on their weather prediction. They should include the temperature, wind speed, whether there will be any form of precipitation (and what it might be, i.e. rain, snow, hail), and wind direction.  Book: The Science Behind Weather by Darlene Stille, or use the myON link: <https://www.myon.com/reader/index.html?a=tscbh_wther_s12>  **EXPLAIN**  Video: “Why It’s Hard to Forecast the Weather/National Geographic” (1:56): <https://www.youtube.com/watch?v=6ES_MIJQH_A>  Weather forecasters rely on computer data, satellite images and their own observations to accurately forecast the weather. They’ve also got their own language for explaining it. Read on to learn how to understand a weather forecast. A high-pressure system occurs when dry, cool air spirals in a clockwise direction, bringing mild weather and sunny, blue skies.  A low-pressure system is moist, warm air swirling in a counter-clockwise direction. Low pressure systems usually mean stormy, wet weather. Relative humidity refers to how much moisture is in the air compared with how much moisture the air can hold. The more humid it is, the warmer you feel in hot weather and the colder you feel in winter weather. |
| **Enrichment** | **EXTEND**  Using each group’s weather prediction, the next day, compare and contrast the prediction to the actual weather. How close was each group? What factors may have contributed to the difference between the prediction and the actual weather? If they had to predict the weather for an additional day, what changes would they make? What would they do the same?  Video: “Five Day Weather Forecast” (4:04): <https://www.youtube.com/watch?v=zbHW1T7boSc> |
| **Closure** | **ELABORATE**  Video: “The Science Behind Weather Forecasting” (2:16): <https://www.youtube.com/watch?v=Ge3GtOmO5xM>  Predicting weather isn’t always an easy task. However, using the different instruments accessible to meteorologists, as well as using trends and data from current and previous weather reports, a prediction can be made with a relatively high rate of accuracy. Using graphs and trends are highly important methods used to forecast the weather. |
| **Assessment** | **EVALUATE**  Formative: Ask the students to share their findings. Ask students: How did your graph help to predict the weather for the following day? |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss the way that weather is predicted, including the different instruments meteorologists use. Review the graphs created by the students, including the trend lines. Ask the student: Does the graph help with predicting the weather? Why or why not? | Discuss the way that weather is predicted, including the different instruments meteorologists use. Review the graphs created by the students, including the trend lines. Ask the student: If the graphing were to continue for another week, what would happen to the trend line? | Discuss the way that weather is predicted, including the different instruments meteorologists use. Review the graphs created by the students, including the trend lines. Ask the student: What other type of graph would be helpful to track the weather? Why? |
| **ELL Strategies** | | |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student explain the graph and chart. Check for understanding.  *Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the different ways the different weather instruments help predict the weather. Repeat the motions with them until they are able to tell you what they are.  *Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. | | |
| **DOK Question (Level 2)** | | |
| Ask students: Can you explain how the graph affected the predictions? Did it have an important or unimportant effect on the following day’s actual weather? | | |
| **Interactive Technology** | | |
| App: Live Weather – Weather Radar & Forecast – Fotoable, Inc.  App: The Weather Channel: Live Maps – Hurricane forecast & updates  Interactive: intellicast: The Authority in Expert Weather: <http://www.intellicast.com/Local/WxMap.aspx>  Interactive Weather Maker: <http://teacher.scholastic.com/activities/wwatch/sim/game.htm>  Interactive: Weather Report For Kids: <https://kidsweatherreport.com/> | | |

Lesson 8: What are weather-related hazards?

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| **Learning Target**  **Objective**  **Standard** | Natural processes on Earth result in a variety of hazards. Natural hazards cannot be eliminated, but preventative measures can be taken to reduce their impact.  Students will identify a variety of natural hazards that have occurred on Earth and the cause of these hazards.  3-ESS3-1: Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard. |
| **Materials** | Computer, individual white boards, white board markers, science notebooks, rubber gloves, plastic forks, tin foil, Styrofoam plates, wool |
| **Books** | Nature’s Fireworks: A Book About Lightning by Josepha Sherman |
| **Vocabulary** | Lightning: The flashing of light caused by the passing of electricity from one cloud to another or between a cloud and the Earth  Thunderstorm: A storm with lightning and thunder, produced by a cumulonimbus cloud |
| **Procedures** | **ENGAGE**  Ask students: What are some types of severe weather? Create a bubble map to document the different answers.  Video: “Severe Weather: Crash Course Kids #28.2” (4:25): <https://www.youtube.com/watch?v=QVZExLO0MWA&t=84s>  Review the different types of weather brainstormed on the bubble map. Do they match the criteria from the video, i.e. “Does it put life or property at risk?”  Have each group compare and contrast their severe weather findings with another group. Ask the students: Do the severe weather types have something in common overall? What types of danger could there be from extreme weather in general?  **EXPLORE**  Students will be researching severe weather, as well as the hazards associated with them. Have the class Mix-Freeze-Group (<https://www.kaganonline.com/>) to create groups of 2-6 (depending on the class size.) Assign each group one of the brainstormed ideas, or choose from the following examples of extreme weather: hurricanes, tornadoes, thunderstorms, extreme heat, drought, lightning, hail, blizzards, and floods. Have each student create a circle map showing the type of weather, and the consequences of this weather. For example: a hurricane can create a storm surge with rising water, tidal flooding, high winds, tornadoes, and heavy rain and flooding in the aftermath. Once they have determined the results of the extreme weather, the groups should brainstorm how to handle the effects of the severe weather. Non-fiction books or websites may be used for research.  Science Project: How to Make Lightning: <https://www.education.com/science-fair/article/make-your-lightning/>  Teacher’s note: The experiment is more effective if it is not humid outside  Students can do the experiment individually, or in their groups. Fold the tin foil around the plastic fork so it looks like a spatula. Make sure it is as flat as possible. Put on the rubber glove and use the gloved hand to rub the Styrofoam plate or rubber balloon on the wool. Place the plate or balloon on a table, and use the gloved hand to pick up the tin foil spatula. Place the tin foil part of the spatula on the balloon or plate. Touch the foil with your other hand. Pull up the spatula from the balloon or plate and touch it again. Experiment with other materials. Recharge the charged object with your hair or wool if necessary.  **EXPLAIN**  Book: Nature’s Fireworks: A Book About Lightning by Josepha Sherman, or use the myON link: <https://www.myon.com/reader/index.html?a=we_nfireworks_f03>  The “lightning” that was seen is a result of static electricity caused by the movement of electrons. Electrons carry a negative electrical charge, which causes them to be attracted to protons and repelled from other electrons. When an object is rubbed with the wool, it does one or two things: it either puts electrons onto the balloon, or strips electrons off of the Styrofoam plate. This gives the balloon or plate a net charge, meaning the objects has either more electrons or fewer electrons than protons. When a metal object is placed near something with a net charge, the electrons will move to be as far away from a negative charge as possible. Lightning occurs when there’s a big charge difference between the clouds in the sky and the earth. Lightning is a bigger version of static electricity.  Severe weather can be extremely damaging. It is important for meteorologists to be able to predict when severe weather can occur to give people time to prepare: whether it is to evacuate, fortify their homes, go below ground, or somewhere up higher. It is important not only to predict severe weather – it is important to know what to do if faced with this weather.  Video: “What Causes Thunder and Lightning?” (3:37): <https://www.youtube.com/watch?v=fEiVi9TB_RQ> |
| **Enrichment** | **EXTEND**  Discuss the different types of extreme weather. Ask the students: What types of severe weather happen in our area? For example, in Nevada, one of the more common types of severe weather happens in the form of flash floods. While discussing local severe weather, find a video with some local footage to show what can happen in the immediate area to give students an understanding and local connection.  Nevada Video: Heavy storms cause flash flooding around Las Vegas valley (6:39): <http://www.lasvegasnow.com/news/heavy-storms-cause-flash-flooding-around-las-vegas-valley/425639665> |
| **Closure** | **ELABORATE**  Severe weather isn’t always predictable. Although meteorologists have made strides towards knowing when and where certain types of weather will strike, it does surprise people on occasion. It is also not possible to stop severe weather; rather, people need to take precautions about how and what to do during a certain weather event. |
| **Assessment** | **EVALUATE**  Formative: Check each group’s severe weather circle map for understanding, including identifying effects of severe weather and how people can prepare. Each circle map will be used in the next lesson. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss the different types of extreme weather, including the hazards associated with each one and the impact on people and the environment. Review specific weather conditions and reteach as necessary. | Discuss the different types of extreme weather, including the hazards associated with each one and the impact on people and the environment. Ask the student: How are the different weather conditions related to each other? What do they have in common? | Discuss the different types of extreme weather, including the hazards associated with each one and the impact on people and the environment. Ask the student: Why do some of these extreme weather conditions only exist in certain areas? |
| **ELL Strategies** | | |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student draw pictures of the different terms discussed in the lesson.  *Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the different types of weather. Repeat the motions with them until they are able to tell you what they are.  *Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. | | |
| **DOK Question (Level 2)** | | |
| Ask students: What do you notice about the different types of extreme weather? How are the different examples different from “typical” weather? Do the same precautions need to be taken? Why or why not? | | |
| **Interactive Technology** | | |
| App: Storm! – Lightning strike distance  Game: Weather WizKids: <http://www.weatherwizkids.com/weather-safety.htm>  Interactive: National Geographic Kids: Wacky Weather Videos: <https://kids.nationalgeographic.com/explore/youtube-playlist-pages/youtube-playlist-weather/>  Games: Weather Games for Kids: <https://www.learninggamesforkids.com/weather-games.html> | | |

Lesson 9: What are some preventions for weather-related hazards?

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| **Learning Target**  **Objective**  **Standard** | Engineers improve existing designs to resist severe weather damage.  Students will be able to identify ways to prevent impacts from hazardous weather, reviewing various engineering designs and identifying one for hazardous prevention.  3-ESS3-1: Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.  3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.  3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.  3-5-ETS1-3: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. |
| **Materials** | Computer, individual white boards, white board markers, science notebooks, 40-quart plastic containers, toilet paper rolls, sandwich sized plastic bags, 3/8” by ¾” foam piping, measuring cups, sand, cotton balls, craft sticks, aluminum foil, water |
| **Books** | Eye of the Storm: A Book About Hurricanes by Rick Thomas |
| **Vocabulary** | Hurricane: A large rotating storm with high speed winds that forms over warm waters in tropical areas, with sustained winds of at least 74 miles per hour and an area of low air pressure called the eye |
| **Procedures** | **ENGAGE**  Video: “Severe Weather” (4:13): <http://www.teachertube.com/video/severe-weather-66775>  Review the examples of severe weather as discussed in the previous lesson. Ask students: What types of preventative measures can be taken in cases of extreme weather? Using the circle maps, brainstorm ideas that could potentially be used to combat the different types of weather. For example: levees for flooding; storm shelters for tornadoes; staying away from windows in a hurricane or tornado; and so on.  The students will be focusing on one form of severe weather to create a structure to prevent a storm surge. Hurricanes can be one of the most devastating forms of severe weather. One of the most common occurrences during a hurricane is a storm surge.  Video: “Hurricanes – Learning about Hurricanes for kids and children” (2:17):  <https://www.youtube.com/watch?v=uw-ts4TvcsY>  **EXPLORE**  Video: “Storm Surge” (3:04): <https://oceanservice.noaa.gov/podcast/may14/mw125-stormsurge.html>  BetterLesson Plans: Protect My Home!: <https://betterlesson.com/lesson/634338/protect-my-home>  Have students Mix-Freeze-Group (<https://www.kaganonline.com/>) to create groups of 2-6 (depending on class size,) or use the same groups from the previous lesson. Each group should receive the materials: 1 40-quart plastic container, 1 paper house, 4 plastic bags, 10 inches of foam piping, 2 cups of sand, 8 cotton balls, 4 craft sticks, 9” sheet of aluminum foil, and 2 cups of water. Before the experiment begins, explain that the toilet paper roll represents a house.  Have each team test their materials. You may limit them to 2 materials, or let them explore them all in order to create something that will barricade their paper house from the water. To test the materials, have the students make a small hole with their pencil at the bottom of one of the Styrofoam cups. Place one of the materials they want to test inside the cup, covering the hole. Place the test cup inside the cup without the hole. Pour ¼ water over the material and observe how the material holds the water inside the cup. Document the findings in the science notebook. Test second (and any additional) material using the same method.  Each group should design a solution by drawing a picture of a design in their science notebooks. Materials should be based on which were found to be the most water-resistant. The plans should be labeled with the materials they will be using.  Using the materials the students found to be water resistant, they should build some kind of a structure to protect the paper house. The paper house should be placed in the middle of the plastic container with the materials surrounding it. Make sure the students build the structure as close to their design as possible. Students should be given a limited amount of time to create their structure (10 minutes.)  **EXPLAIN**  Video: “What’s a Hurricane?” (4:09): <https://www.youtube.com/watch?v=xKubdY2mHXc>  Ask the students: If they had different materials, what else would be added or taken away from the design? How would you make it better? Students can also compare their designs to other students’ designs in the room. Students can then RallyCoach (<https://www.kaganonline.com/>) with another group to see if there are improvements that can be made in their original design, including in their drawing.  Students should add on to their drawings regarding the methods that worked, and those that did not. They can either show what happened when water was added on their original drawing, or draw a sketch of the results of the test.  Book: Eye of the Storm: A Book About Hurricanes by Rick Thomas, or use the myON link: <https://www.myon.com/reader/index.html?a=as_hurri_s05> |
| **Enrichment** | **EXTEND**  The process can be repeated, but with unlimited quantities of each material. However, there is a cost attached to each material. For example: the students have $20 to create their structure. Cotton balls cost 10 cents each, plastic bags cost 50 cents each, and so on. |
| **Closure** | **ELABORATE**  Different structures are used for hurricane protection – some are permanent, while others are temporary. In finding what materials would work for a protective structure, there is an opportunity to use this knowledge to help engineers create structures in the future.  Video: “FEMA: Levee Construction” (2:26): <https://www.fema.gov/media-library/assets/videos/76921> |
| **Assessment** | **EVALUATE**  Formative: Check each group’s notes in their science notebook for understanding, including their drawings and documentation of the results. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss hurricanes, including storm surges and levees. Review how storm surges are more dangerous than the wind, and why it is important for engineers to design structures to withstand the impact of the water. | Discuss hurricanes, including storm surges and levees. Ask the student to define the difference between a dam and a levee. Which is more often used during a hurricane? Why? | Discuss hurricanes, including storm surges and levees. Ask the student: What other extreme weather would require a structure like the one used for a hurricane? What would be the best material to use for a levee? Explain your thinking. |
| **ELL Strategies** | | |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student draw pictures representing a hurricane and a storm surge.  *Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore what a hurricane and storm surge look like. Repeat the motions with them until they are able to tell you what they are.  *Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. | | |
| **DOK Question (Level 3)** | | |
| Ask students: How would you test a different type of shelter? For example, if you were building a structure for extreme heat, what materials would you use? What about for other forms of extreme weather? | | |
| **Interactive Technology** | | |
| App: Hurricane.io – Grow into a monster storm!  App: Hurricane: American Red Cross  Games: Hurricanes: <https://www.wartgames.com/themes/weather/hurricanes.html>  Games: #Hurricane Strong Kids: <http://www.flash.org/hurricanestrong/kids.php> | | |

Lesson 10: What is climate?

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| **Learning Target**  **Objective**  **Standard** | Climate describes the typical weather conditions of an area over a long period of time.  Students will be able to compare the temperature and precipitation of different locations over a given period of time.  3-ESS2-2: Obtain and combine information to describe climates in different regions of the world. |
| **Materials** | Computer, individual white boards, white board markers, science notebooks, globe or world map for class, individual world maps, individual computers or non-fiction books on climate |
| **Books** | Zoom In on Climate Maps by Kathy Furgang |
| **Vocabulary** | Climate: The weather conditions in an area over a long period of time  Weather: A short term description of the air in an area measured by temperature, precipitation, humidity, wind, and other factors |
| **Procedures** | **ENGAGE**  Ask students: What do you think the difference between weather and climate might be? How can you tell the difference? Have students HandUp-PairUp - ShareUp (<https://www.kaganonline.com/>) to discuss the difference between what they think weather and climate are.  Video: “Learning About Climates” (5:48): <https://www.youtube.com/watch?v=eLFY_0AheOA>  **EXPLORE**  Video: “Weather vs. Climate: Crash Course Kids #28.1” (4:32): <https://www.youtube.com/watch?v=YbAWny7FV3w&t=5s>  Create a double bubble map to compare and contrast climate and weather. Review that climate is over a long period of time, while weather can change on a daily basis. Once the difference has been discussed, describe the different climate zones around the world.  Video: “What are climate zones?” (4:48): <https://www.youtube.com/watch?v=pR2_s0dCNn4>  Tropical: Hot and wet  Arid: Dry and hot all year  Mediterranean: Mild winters; hot, dry summers  Temperate: Mild summers, mild winters  Polar: Extremely cold and dry all year  Highlands/Mountains: Very cold all year, covers the tops of mountains  Sciencing: What are the Six Major Climate Regions?: <https://sciencing.com/six-major-climate-regions-5382606.html>  **EXPLAIN**  Different parts of the world have very different patterns of weather. The Earth’s climate is driven by energy from the sun which arrives in the form of heat. Half of this energy travels through our atmosphere and reaches the Earth’s surface. The other half is either absorbed by the atmosphere or reflected back into space. Because the Earth is a sphere, the sun’s rays reach the Earth’s surface in polar regions at a much more slanted angle than at the Equator. The extra energy at the Equator is spread out, which creates different climate zones across the world. Warm air rises at the Equator and moves toward the poles. Where warm, wet air rises, there are thunderstorms and tropical rainforests. When air sinks, it stops clouds from forming, making it rain less and creating deserts.  Book: Zoom In on Climate Maps by Kathy Furgang |
| **Enrichment** | **EXTEND**  Take a look at the interactive map to see the current temperature, precipitation, and so on: MeteoEarth: <http://www.meteoearth.com> |
| **Closure** | **ELABORATE**  Vegetation can affect the local climate. In equatorial rainforests, dense vegetation blocking the wind combined with high temperature and rainfall mean it’s a very humid place to be. Where there’s no vegetation, the air can be much drier, and the wind can blow. In busy cities, the air temperature is often warmer than the surrounding countryside, particularly at nighttime. This is due to buildings and roads absorbing heat during the day, and giving it off at night.  Just because a place has one climate doesn’t mean it won’t change. Climate scientists take measurements over long periods of time to track patterns in temperature and rainfall. These help to know what to expect today and in the future, but also track changes in the past. |
| **Assessment** | **EVALUATE**  Formative: Check the maps and data gathered for understanding. Ask students to compare their climate zone to one other climate zone. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss the different climate zones, including the characteristics that make them unique. Ask the student to describe the similarities and differences between the different zones to check for understanding. | Discuss the different climate zones, including the characteristics that make them unique. Ask the student: Why are the different zones located where they are? For example, why would a warmer climate zone be located by the equator, and a colder zone on the different poles? | Discuss the different climate zones, including the characteristics that make them unique. Ask the student: What would make the climate different in these areas? |
| **ELL Strategies** | | |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student draw pictures of the different zones, including details from each area.  *Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the different types of climate zones, including discussing some unique qualities of each area. Repeat the motions with them until they are able to tell you what they are.  *Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. | | |
| **DOK Question (Level 2)** | | |
| Ask students: Can you explain how the climate affects how you live? Does it influence how you spend your time, like being indoors or outdoors? Does it affect what people do for a living? | | |
| **Interactive Technology** | | |
| App: Climate – Weather visualized with colors  App: Global Climate – Douglas Rudd  Games: NASA Climate Kids: <https://climatekids.nasa.gov/menu/play/>  Games: Climate Interactive: <https://www.climateinteractive.org/policy-exercises-and-serious-games/19-climate-games-that-could-change-the-future/>  Games: Climate Change Live: <https://climatechangelive.org/index.php?pid=185> | | |

Lesson 11: How can weather and climate data be used to describe the world?

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| **Learning Target**  **Objective**  **Standard** | Temperatures and precipitation rates from various locations can help determine the climate of a region or an area.  Students will compare weather and climate data of different locations.  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. |
| **Materials** | Computer, computers for each student or group, graph paper, colored pencils |
| **Books** | Climate (Science Readers: Content and Literacy) by Teacher Created Materials |
| **Vocabulary** | Climograph: A graphical representation of basic climatic parameters that is monthly average temperature and precipitation at a certain location |
| **Procedures** | **ENGAGE**  Video: “Climatographs Song” (3:46): <https://www.youtube.com/watch?v=-iH-CZO1r2g>  Video: “Climate Graphs – Geo Skills” (3:41): <https://www.youtube.com/watch?v=Wv6yHl0LpgM>  Students will be examining climographs in different parts of the country to compare the data on the graph to the climate previously identified.  **EXPLORE**  Climographs are used to show climate around the world.  Annual climatology around the world: <http://drought.unl.edu/archive/iclimographs/>  Using the climate graphs around the world, show how the average temperatures and precipitation data is put into the graph. Using the maps made in the previous lesson, have the students look at the climograph and determine which of the six previously identified climate zones would match the graph.  Tropical: Hot and wet  Arid: Dry and hot all year  Mediterranean: Mild winters; hot, dry summers  Temperate: Mild summers, mild winters  Polar: Extremely cold and dry all year  Highlands/Mountains: Very cold all year, covers the tops of mountains  For example: examining the graph of Reykjavik, Iceland: in which climate zone is it located? (polar) Does it match the average temperature and precipitation? Look at the city and compare them to the characteristics found in the previous lesson. Give the students the cities to look up, but not the climate.  Other cities: Bangkok, Thailand (tropical); London, England (temperate); Casablanca, Morocco (arid); Melbourne, Australia (Mediterranean);  Remind students that in different areas, summer and winter are in different months. For example: in Australia, the summer months are December, January, and February.  U.S. climate data: <https://www.usclimatedata.com/>  Have the class Mix-Freeze-Group (<https://www.kaganonline.com/>) to create groups of 2-6 (depending on the class size) or use groups from previous lesson. The students should first research the climate data from their chosen city. Once they have looked up their city, they need put the temperatures into a chart, as used in the graphing data from the national cities. Once they have done this, each group should create their climograph using graph paper, colored pencils, and their chart. Check each group’s climograph in comparison to the data they researched and check for understanding.  **EXPLAIN**  Book: Climate (Science Readers: Content and Literacy) by Teacher Created Materials  Annual climatology around the world: <http://drought.unl.edu/archive/iclimographs/>  Using one of the links, click on an area (make sure to use MTMP for standard measurement.)  For U.S. cities: National Drought Mitigation Center: <http://drought.unl.edu/DroughtBasics/WhatisClimatology/ClimographsforSelectedUSCities.aspx>  Click on your city, or a city close to yours. Example: Las Vegas, Nevada  Las Vegas English Units  <http://drought.unl.edu/archive/climographs/LasVegasANC.htm>  Discuss the different parts of the graph. The graph is based on climate with the data being taken for a long period of time. In the graph above, the data is based on average temperatures and precipitation from 1971-2000. By using two different types of graphs on the same chart, two different measurements from the same area can be shown. The bar graph shows the average monthly rainfall, while the line graph shows the average temperature. Compare the temperature and precipitation and temperature of the local city to another city with a different weather pattern. For example, comparing Las Vegas, NV to Seattle, WA. |
| **Enrichment** | **EXTEND**  Create your own city, with a series of average temperatures and rainfall. Create a class climograph. Ask students: Which climate zone would best fit our new city? Why? |
| **Closure** | **EXPLAIN**    Review the KWL chart made at the beginning of the unit, and fill in the L portion. If there is anything missing, add any unanswered topics or questions. |
| **Assessment** | Formative: Ask students to show their climograph and describe how it works. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss the climographs, including inputting data as a bar graph and line graph. Review the KWL chart from the unit and check for understanding. | Discuss the climographs, including inputting data as a bar graph and line graph. Review the KWL chart from the unit and check for understanding. Ask student: Why is it important to study an area’s climate? | Discuss the climographs, including inputting data as a bar graph and line graph. Review the KWL chart from the unit and check for understanding. Ask student: Do cities located in the same state always have the same type of weather? What about cities in the same country? |
| **ELL Strategies** | | |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student draw pictures of the different climate zones and climographs.  *Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the different types of climates, including reviewing the climographs used throughout the unit. Repeat the motions with them until they are able to tell you what they are.  *Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. | | |
| **DOK Question (Level 2)** | | |
| Ask students: How would you apply what you learned to develop structures in a certain area? How would a house in a tropical are be different from one in a temperate area? What about clothes? | | |
| **Interactive Technology** | | |
| Interactive: Interpret a Climograph: <https://www.internet4classrooms.com/grade_level_help/geography_climographs_fifth_5th_grade_social_studies.htm> | | |

Earth Science Unit Assessment

1. What is the difference between weather and climate?
2. List four different instruments used to measure weather, along with what they measure.
3. Draw a picture of the water cycle, and label the different stages.
4. List four different types of extreme weather along with one characteristic of each.

Student Research Project: What are the different characteristics of the climate zones?

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| **Learning Target**  **Objective**  **Standard** | Climate describes the typical weather conditions of an area over a long period of time.  Students will be able to compare the temperature and precipitation of different locations over a given period of time.  3-ESS2-2: Obtain and combine information to describe climates in different regions of the world.  RI.3.1: Ask and answer questions to demonstrate the understanding of a text, referring explicitly to the text as the basis for the answers.  RI.3.7: Use information gained from illustrations (e.g., maps, photographs) and words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur.)  RI.3.9: Compare and contrast the most important points and key details presented in two texts on the same topic.  W.3.7: Conduct short research projects that build knowledge about a topic.  W.3.8: Recall information from experiences or gather information from print and digital sources: take brief notes on sources and sort evidence into provided categories.  SL.3.4: Recount on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.  SL.3.6: Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification. |
| **Materials** | Computer, globe or world map for class, individual world maps, individual computers or non-fiction books on climate |
| **Books** | Tropical Climates by Cath Senker  Temperate Climates by Cath Senker  Polar Climates by Cath Senker  Desert Climates by Cath Senker |
| **Vocabulary** |  |
| **Procedures** | **ENGAGE**  Video: “Weather and Climate” (3:54): <https://www.youtube.com/watch?v=UC38Rf70px8>  Ask the students: Could we use the weather data collected to forecast what the weather will be like in 10 weeks? 20 weeks? Why or why not? Ask students: What would you need to know to predict the weather for the next 20 weeks? Could the data be used to predict next week’s forecast for another part of the country? Why or why not?  **EXPLORE**  The students will be creating a climate map of the world by researching the different climate zones and finding where they are located. Have students Mix-Freeze-Group (<https://www.kaganonline.com/>) by asking which climate they would like to research. If there are too many students in a group, some movement may need to be done. Students should be divided into six groups. Each group will be in charge of one climate zone.  Using non-fiction books, or internet research, each group should look up some facts about their climate, including where it is located and some basic facts about the climate, the types of plants and animals that live there, and any other interesting items they would like to share.  Easy Science for Kids: Tropical Climates: <http://easyscienceforkids.com/all-about-tropical-climates/>  Easy Science for Kids: Dry Climates: <http://easyscienceforkids.com/all-about-dry-climates/>  Easy Science for Kids: Temperate or Mild Climate: <http://easyscienceforkids.com/all-about-temperate-or-mild-climate/>  Climate Types for Kids: Mediterranean: <https://sites.google.com/site/climatetypes/mediterranean>  Easy Science for Kids: Polar Climates: <http://easyscienceforkids.com/all-about-polar-climates/>  Climate Types for Kids: Tundra: <https://sites.google.com/site/climatetypes/tundra>  Book: Tropical Climates by Cath Senker, or use the myON link: <https://www.myon.com/reader/index.html?a=fcz_trop_s17>  Book: Temperate Climates by Cath Senker, or use the myON link: <https://www.myon.com/reader/index.html?a=fcz_temp_s17>  Book: Polar Climates by Cath Senker, or use the myON link: <https://www.myon.com/reader/index.html?a=fcz_polar_s17>  Book: Desert Climates by Cath Senker, or use the myON link: <https://www.myon.com/reader/index.html?a=fcz_desert_s17>  **EXPLAIN**  Students can use the big map to color their portion of the class map to show their particular climate zone. The group can each give a few facts about their area and describe how their climate is different than others. Once the class map is colored and labeled, the students can color and label their own map with the different climate zones.  Video: “What are climate zones?” (4:48): <https://www.youtube.com/watch?v=pR2_s0dCNn4>  Tropical: Hot and wet  Arid: Dry and hot all year  Mediterranean: Mild winters; hot, dry summers  Temperate: Mild summers, mild winters  Polar: Extremely cold and dry all year  Highlands/Mountains: Very cold all year, covers the tops of mountains  Sciencing: What are the Six Major Climate Regions?: <https://sciencing.com/six-major-climate-regions-5382606.html>  http://www.geography.learnontheinternet.co.uk/images/worldclimate.gif  <http://www.geography.learnontheinternet.co.uk/topics/climatezones.html> |
| **Enrichment** | **EXTEND**  Take a look at the interactive map to see the current temperature, precipitation, and so on: MeteoEarth: <http://www.meteoearth.com> |
| **Closure** | **EXPLAIN**  Using the maps, have students compare the different climate zones to other groups. Describe the difference between the different zones, and how this information would be helpful when traveling or even picking somewhere to live. |
| **Assessment** | **EVALUATE**  Formative: Check the maps and data gathered for understanding. Ask students to compare their climate zone to one other climate zone. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| Discuss the different climate zones, including the characteristics that make them unique. Ask the student to describe the similarities and differences between the different zones to check for understanding. | Discuss the different climate zones, including the characteristics that make them unique. Ask the student: Why are the different zones located where they are? For example, why would a warmer climate zone be located by the equator, and a colder zone on the different poles? | Discuss the different climate zones, including the characteristics that make them unique. Ask the student: What would make the climate different in these areas? |
| **ELL Strategies** | | |
| *Visual Aids:* Show the student pictures of the different vocabulary words described in the lesson, and/or have the student draw pictures of the different zones, including details from each area.  *Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to explore the different types of climate zones, including discussing some unique qualities of each area. Repeat the motions with them until they are able to tell you what they are.  *Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. | | |
| **DOK Question (Level 2)** | | |
| Ask students: Can you explain how the climate affects how you live? Does it influence how you spend your time, like being indoors or outdoors? Does it affect what people do for a living? | | |
| **Interactive Technology** | | |
| Interactive: FunKids: Climate Zones: [http://www.funkidslive.com/learn/marina-ventura/climate-explorers/major-climate-zones-world/#](http://www.funkidslive.com/learn/marina-ventura/climate-explorers/major-climate-zones-world/) | | |

Third Grade Writing Rubric

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| **Standard** | **Exceeds Expectations - 3** | **Meets Expectations - 2** | **Below Expectations - 1** |
| 3-ESS2-2: Obtain and combine information to describe climates in different regions of the world. | Student included details about how their climate. | Student included some details about their climate. | Student included few or no details about their climate. |
| W.3.7: Conduct short research projects that build knowledge about a topic. | Student participated fully in research. | Student somewhat participated in research. | Student did not participate in class research. |
| W.3.8: Recall information from experiences or gather information from print and digital sources: take brief notes on sources and sort evidence into provided categories. | Student used at least 2 sources to find information about their climate. | Student used one source to find information about their climate. | Student did not use sources to find out information about their climate. |
| RI.3.1: Ask and answer questions to demonstrate the understanding of a text, referring explicitly to the text as the basis for the answers. | Student is able to answer questions on climate to complete their research project. | Student is somewhat able to answer questions on climate to complete their research project. | Student is not able to answer questions on climate to complete their research project. |
| RI.3.7: Use information gained from illustrations (e.g., maps, photographs) and words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur.) | Student found many similarities in at least two sources regarding information and pictures/diagrams about their climate. | Student found some similarities in at least two sources regarding information and pictures/diagrams about their climate. | Student did not find similarities regarding information and pictures/diagrams about their climate. |
| RI.3.9: Compare and contrast the most important points and key details presented in two texts on the same topic. | Student used two sources to connect information about their climate. | Student used one source to locate information about their climate or did not make a connection. | Student did not use sources or make a connection for information about their climate. |
| SL.3.4: Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. | Student was able to clearly express the facts learned about their climate. | Student was somewhat able to express the facts learned about their climate. | Student was unable to express the facts learned about their climate. |
| SL.3.6: Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification. | Student is able to recall at least three details and present them orally regarding their climate. | Student is able to recall one to two details and present them orally regarding their climate. | Student is not able to recall details or present them orally regarding their climate. |

Points: \_\_\_\_\_\_ / \_\_\_\_\_\_\_= \_\_\_\_\_\_\_\_% Comments:

STEM Unit Project: Tornado Structure

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| **Learning Target**  **Objective**  **Standards** | Engineering design is a process used to solve real world problems. Students will  use the five-step engineering design process to solve problems.  Students will design and build a structure that will reduce the warming effect of sunlight on an area.  3-ESS3-1: Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.  3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.  3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.  3-5-ETS1-3: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved. |
| **Materials** | Computer, hair dryer, cardboard, tape, string, paper, foil, construction paper, pipe cleaner, water bottle, glue, toilet paper tube, rubber band, craft sticks, paper towel tube, straws, paper cup, index cards |
| **Vocabulary** | Tornado: A violent destructive whirling wind accompanied by a funnel-shaped cloud |
| **Design Process** | **ASK**  Identify the problem. Identify the constraints  **IMAGINE** Identify some possible solutions  **PLAN** Draw a plan and identify the materials  **CREATE** Use the plan and create. Test it!  **IMPROVE** Modify your design to make it better. Test it out! |
| **Procedures** | **ASK**  Tornadoes can produce winds of over 250 mph. According to NOAA, about 1,000 tornadoes are reported across the United States in an average year; resulting in 80 deaths and over 1,500 injuries. Approximately 45% of these deaths were people living in mobile homes. Tornadoes affect civil engineers the most because they build, design, and maintain roads, railways, and buildings. Engineers also collect evidence following storms to help classify tornadoes, dispel tornado myths, and find better ways to safely build structures in high-tornado areas.  Video: “What is a Tornado?” (3:46): <https://www.youtube.com/watch?v=-s3UwOq1P1E&t=18s>  Video: “The 7-Year-Old Storm Chaser” (3:13): <https://www.youtube.com/watch?v=bKS1vasg-L8>  Students will be making a tornado-proof shelter. The structure must withstand the force of the strong wind. This will be tested with a hair dryer. The students must use the available supplies and stay within the budget of $20. Have students Mix-Freeze-Group (<https://www.kaganonline.com/>) to form groups of 3-4 (depending on class size.)  **IMAGINE**  As a class and as a group, have the students discuss what kind of structure they would like to make. Discuss the following:  What is the problem that they need to solve? (Preventing the wind from entering the shelter.)  Who has the problem? (The students and teacher.)  Why is the problem important to solve? (People need to stay safe in a tornado.)  **PLAN**  Show the students the materials they will be able to use. Each team has a budget of $20, and each building supply has a cost associated with it.  Cardboard - $10; Tape - $5; String - $3; Paper - $2; Foil - $3; Construction paper - $2; Pipe cleaner - $1; Water bottle - $3; Glue - $3; Toilet paper tube - $3; Rubber bands - $2; Craft sticks: $8; Paper towel tube - $4; Straws - $3; Paper cup - $3; Index cards - $5  Each team needs to design their structure so they are within budget. The structures should be drawn and labeled with the materials they will be using, as well as the dimensions of the structure.  **CREATE**  Students should use the drawings to make a replica of their structure. Explain to them that scientists often make mistakes, and it is only in these mistakes that we can learn and grow. Students can build their prototypes based on the drawings, and make corrections later.  **IMPROVE**  Have students put their structure on a table. Using the hair dryer, test the strength of each structure. The hair dryer should be held at the same distance and for the same amount of time on each structure. As a class, rank the structures for effectiveness based on how well the structure held up to the hair dryer. After structures are ranked, place the structures on a table with most effective to least effective. Have the students identify the characteristics of the more effective structures. Ask the students:   * What things helped the structures stay up? * What things were missing from the structures that did not hold up as well? |
| **Enrichment** | At this time, materials can be added or taken away. Ask the students: if they had different materials or a bigger budget, what else would be added or taken away from the design? How would you make it better? Students can also compare their designs to other students’ designs in the room. Students can then RallyCoach (<https://www.kaganonline.com/>) with another student to see if there are improvements that can be made in their original design, including in their drawing. |
| **Closure** | Describe why different structures may have worked better than others. Would a bigger budget make a difference? Why or why not? |
| **Assessment** | Students should be graded based on the rubric. |

Differentiated Instruction

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| **Below Grade Level** | **On Grade Level** | **Above Grade Level** |
| As the students are working, some may need help with construction and/or evaluating whether the designs were successful or not. Students can be paired based on ability. | Students should be able to create a building either independently or with a partner. Students may need prompting to identify and adjust for any problems with the building. | Students should be able to successfully create a building, and identify any problems it had, as well as identifying a solution to the problem. They should also be able to assist students who are struggling. |
| **ELL Strategies** | | |
| *Visual Aids:* Show the student pictures of the different types of tornado-proof buildings, as well as exploring the different buildings made during the lesson.  *Hands-On*: Using realia (objects and material from everyday life,) give the student a chance to test out the different buildings and how they work. Describe the differences between them, and what makes each one effective.  *Word Wall:* Post new vocabulary terms on the wall with similar terms near each other for easy reference. The flash cards with picture of the words can be incorporated into this strategy, or the student can add it in a notebook. Make sure the student draws their own pictures rather than relying on something drawn for them. | | |
| **DOK Question (Level 3)** | | |
| Ask students: How would you test a building like this if it was full sized? Would stirrers work, or would you need something stronger? Would you test a model or a full-sized version first? Why? | | |
| **Interactive Technology** | | |
| App: Tornado Alley – Nature’s Fury – Ramond Double  App: Tornado: American Red Cross  App: NOAA Weather Radar Live – Weather Forecast & Storm Alert  Games: Tornadoes: <https://www.wartgames.com/themes/weather/tornadoes.html> | | |

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|  | Unsatisfactory Effort (0 points) | Effort Needs Improvement (1 point) | Satisfactory Effort (2 points) | Outstanding Effort (3 points) |
| I contributed to the team work. |  |  |  |  |
| I exhibited scientific thinking. |  |  |  |  |
| I maintained a positive attitude. |  |  |  |  |
| I completed the building task. |  |  |  |  |
| I reflected on my work. |  |  |  |  |

Grading Myself

Grading My Team

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| --- | --- | --- | --- | --- |
|  | Unsatisfactory Effort (0 points) | Effort Needs Improvement (1 point) | Satisfactory Effort (2 points) | Outstanding Effort (3 points) |
| My team worked well together. |  |  |  |  |
| My team displayed problem-solving skills. |  |  |  |  |
| My team had a positive attitude. |  |  |  |  |
| My team completed the building task. |  |  |  |  |
| My team discussed and reflected on our work. |  |  |  |  |

Graded by my Teacher

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| --- | --- | --- | --- | --- |
|  | Unsatisfactory Effort (0 points) | Effort Needs Improvement (1 point) | Satisfactory Effort (2 points) | Outstanding Effort (3 points) |
| Student cooperated with team. |  |  |  |  |
| Student exhibited scientific thinking. |  |  |  |  |
| Student maintained a positive attitude. |  |  |  |  |
| Team completed the building task. |  |  |  |  |
| Student reflected on work. |  |  |  |  |

<http://www.morethanaworksheet.com/wp-content/uploads/2015/07/STEM-Rubric.pdf>

Websites/Videos

Miriam-Webster Word Central: <http://www.wordcentral.com/>

Kagan: <https://www.kaganonline.com/>

“Seasons and the Sun: Crash Course Kids 11.1” (3:56): <https://www.youtube.com/watch?v=b25g4nZTHvM>

“Our World: What is Weather?” (3:13): <https://www.youtube.com/watch?v=UtgFHHhm1xU&t=19s>

Kagan online: <https://www.kaganonline.com/>

Kids’ Crossing: What’s the difference between weather and climate?: <https://eo.ucar.edu/kids/green/what1.htm>

“Be a Weather Watcher” (3:58): <https://www.youtube.com/watch?v=Uo8lbeVVb4M>

The Weather Channel: <https://weather.com/>

Tree House Weather Kids: Anemometer: <https://extension.illinois.edu/treehouse/airpressure.cfm?Slide=9>

“Kid Meteorologist” (1:28): <https://www.youtube.com/watch?v=PvZv3D8SKUA>

“How are weather forecasts made?” (3:06): <https://www.youtube.com/watch?v=fdErsR8_NaU>

Weather Scope: Make and Use a Barometer: <http://www.k12science.org/curriculum/weatherproj2/en/docs/barometer.shtml>

Education.com: Science Project: DIY Rain Gauge: <https://www.education.com/science-fair/article/DIY-rain-gauge/>

Education.com: Science Project: How to Make an Anemometer: <https://www.education.com/science-fair/article/make-anemometer/>

“How to Make a Wind Vane” (2:03): <https://www.youtube.com/watch?v=cnZ5LYI19Vo>

Environmental Monitor: Wind Speed and Direction: <https://www.fondriest.com/news/wind-speed-and-direction.htm>

“Washington Post: This new weather satellite…” (2:54): <https://www.washingtonpost.com/news/capital-weather-gang/wp/2016/11/19/u-s-launches-next-generation-weather-satellite-that-will-revolutionize-forecasting/?utm_term=.e48b9f2d36d0>

“How Weather is Predicted” (1:06): <https://www.youtube.com/watch?v=AVpJd335VcI>

“How a Weather Forecast is Made” (2:47): <https://www.youtube.com/watch?v=I_mvYJlypfo>

“Why It’s Hard to Forecast the Weather/National Geographic” (1:56): <https://www.youtube.com/watch?v=6ES_MIJQH_A>

“How Forecasts Are Made” (3:13): <https://www.youtube.com/watch?v=NX3XVM2Ttp0>

Kids’ Zone: Create a Graph: <https://nces.ed.gov/nceskids/graphing/classic/line_chart.asp?temp=5280082>

“Five Day Weather Forecast” (4:04): <https://www.youtube.com/watch?v=zbHW1T7boSc>

“The Science Behind Weather Forecasting” (2:16): <https://www.youtube.com/watch?v=Ge3GtOmO5xM>

“Severe Weather: Crash Course Kids #28.2” (4:25): <https://www.youtube.com/watch?v=QVZExLO0MWA&t=84s>

Science Project: How to Make Lightning: <https://www.education.com/science-fair/article/make-your-lightning/>

“What Causes Thunder and Lightning?” (3:37): <https://www.youtube.com/watch?v=fEiVi9TB_RQ>

Heavy storms cause flash flooding around Las Vegas valley (6:39): <http://www.lasvegasnow.com/news/heavy-storms-cause-flash-flooding-around-las-vegas-valley/425639665>

“Severe Weather” (4:13): <http://www.teachertube.com/video/severe-weather-66775>

“Hurricanes – Learning about Hurricanes for kids and children” (2:17): <https://www.youtube.com/watch?v=uw-ts4TvcsY>

“What’s a Hurricane?” (4:09): <https://www.youtube.com/watch?v=xKubdY2mHXc>

“Storm Surge” (3:04): <https://oceanservice.noaa.gov/podcast/may14/mw125-stormsurge.html>

BetterLesson Plans: Protect My Home!: <https://betterlesson.com/lesson/634338/protect-my-home>

“FEMA: Levee Construction” (2:26): <https://www.fema.gov/media-library/assets/videos/76921>

“Weather vs. Climate: Crash Course Kids #28.1” (4:32): <https://www.youtube.com/watch?v=YbAWny7FV3w&t=5s>

“Weather and Climate” (3:54): <https://www.youtube.com/watch?v=UC38Rf70px8>

FunKids: “What are Climate Zones?” [http://www.funkidslive.com/learn/marina-ventura/climate-explorers/major-climate-zones-world/#](http://www.funkidslive.com/learn/marina-ventura/climate-explorers/major-climate-zones-world/)

“What are climate zones?” (4:48): <https://www.youtube.com/watch?v=pR2_s0dCNn4>

Sciencing: What are the Six Major Climate Regions?: <https://sciencing.com/six-major-climate-regions-5382606.html>

Easy Science for Kids: Tropical Climates: <http://easyscienceforkids.com/all-about-tropical-climates/>

Easy Science for Kids: Dry Climates: <http://easyscienceforkids.com/all-about-dry-climates/>

Easy Science for Kids: Temperate or Mild Climate: <http://easyscienceforkids.com/all-about-temperate-or-mild-climate/>

Climate Types for Kids: Mediterranean: <https://sites.google.com/site/climatetypes/mediterranean>

Easy Science for Kids: Polar Climates: <http://easyscienceforkids.com/all-about-polar-climates/>

Climate Types for Kids: Tundra: <https://sites.google.com/site/climatetypes/tundra>

Internet Geography: World Climate Zones: <http://www.geography.learnontheinternet.co.uk/topics/climatezones.html>

MeteoEarth: <http://www.meteoearth.com>

“Climatographs Song” (3:46): <https://www.youtube.com/watch?v=-iH-CZO1r2g>

“Climate Graphs – Geo Skills” (3:41): <https://www.youtube.com/watch?v=Wv6yHl0LpgM>

Annual climatology around the world: <http://drought.unl.edu/archive/iclimographs/>

National Drought Mitigation Center: <http://drought.unl.edu/DroughtBasics/WhatisClimatology/ClimographsforSelectedUSCities.aspx>

Annual Climatology: Las Vegas, NV: <http://drought.unl.edu/archive/climographs/LasVegasANC.htm>

Annual climatology around the world: <http://drought.unl.edu/archive/iclimographs/>

“What is a Tornado?” (3:46): <https://www.youtube.com/watch?v=-s3UwOq1P1E&t=18s>

“The 7-Year-Old Storm Chaser” (3:13): <https://www.youtube.com/watch?v=bKS1vasg-L8>

Study.com: Rain Gauge Lesson for Kids: Definition & Facts: <https://study.com/academy/lesson/rain-gauge-lesson-for-kids-definition-facts.html>

Easy Science for Kids: Tropical Climates: <https://easyscienceforkids.com/all-about-tropical-climates/>

The Cat in the Hat Knows a Lot About That: “Weather Transformer”:<http://pbskids.org/catinthehat/games/weather-transformer>

EduPlace/ Houghton Mifflin Company: “Discover! Looking at the Sky”:<http://www.eduplace.com/kids/hmsc/activities/simulations/grk/unitd.html>

Easy Science for Kids: Fun Barometers Quiz: <https://easyscienceforkids.com/fun-barometers-quiz-free-online-interactive-science-quiz/>

Tree House Weather Kids: Under An Ocean of Air Pressure: <https://extension.illinois.edu/treehouse/airpressure.cfm?Slide=1>

Oddizzi: Precipitation: <http://www.oddizzi.com/teachers/explore-the-world/weather/weather-types/precipitation/>

Science Kids: Weather Facts: Rain Facts for Kids: <http://www.sciencekids.co.nz/sciencefacts/weather/rain.html>

BrainPOP: Wind Simulator: <https://www.brainpop.com/games/windsimulator/>

BBC Schools: Wind Direction: <http://www.bbc.co.uk/schools/whatisweather/aboutweather/winddir.shtml>

PBS Kids: Sid the Science Kid: “Weather Surprise” <http://pbskids.org/sid/fablab_weathersurprise.html>

Math is Fun: “The Interactive Thermometer” <https://www.mathsisfun.com/measure/thermometer.html>

intellicast: The Authority in Expert Weather: <http://www.intellicast.com/Local/WxMap.aspx>

Weather Maker: <http://teacher.scholastic.com/activities/wwatch/sim/game.htm>

Weather Report For Kids: <https://kidsweatherreport.com/>

Weather WizKids: <http://www.weatherwizkids.com/weather-safety.htm>

National Geographic Kids: Wacky Weather Videos: <https://kids.nationalgeographic.com/explore/youtube-playlist-pages/youtube-playlist-weather/>

Weather Games for Kids: <https://www.learninggamesforkids.com/weather-games.html>

Hurricanes: <https://www.wartgames.com/themes/weather/hurricanes.html>

#Hurricane Strong Kids: <http://www.flash.org/hurricanestrong/kids.php>

NASA Climate Kids: <https://climatekids.nasa.gov/menu/play/>

Climate Interactive: <https://www.climateinteractive.org/policy-exercises-and-serious-games/19-climate-games-that-could-change-the-future/>

Climate Change Live: <https://climatechangelive.org/index.php?pid=185>

Interpret a Climograph: <https://www.internet4classrooms.com/grade_level_help/geography_climographs_fifth_5th_grade_social_studies.htm>

FunKids: Climate Zones: [http://www.funkidslive.com/learn/marina-ventura/climate-explorers/major-climate-zones-world/#](http://www.funkidslive.com/learn/marina-ventura/climate-explorers/major-climate-zones-world/)

Tornadoes: <https://www.wartgames.com/themes/weather/tornadoes.html>

Software Applications (Apps)

School Bell Weather – Weather for Kids – Ladeez First Media

MarcoPolo Weather – The Weather Learning Game

Free Barometer – Atmospheric and Air Pressure – Margaret kovatch

Air Pressure Free – Piet Jonas

Barometer GPS – current barometric pressure – Sun Dong Chen

Pocket Rain Gauge - Agrible

Wind Speed Meter – Anemometer

Windy Marine – Miha Korosec

BreezeView Pad – Etesian Technologies LLC

Barometer & Altimeter Pro – Steffen Bauereiss

Barometer Plus – Altimeter – Advance Barometer

Digital Thermometer app – Current temperature&humidity

Thermometer++ - Viachaslau Tysianchuk

Live Weather – Weather Radar & Forecast – Fotoable, Inc.

The Weather Channel: Live Maps – Hurricane forecast & updates

Storm! – Lightning strike distance

Hurricane.io – Grow into a monster storm!

Hurricane: American Red Cross

Climate – Weather visualized with colors

Global Climate – Douglas Rudd

Tornado Alley – Nature’s Fury – Ramond Double

Tornado: American Red Cross

NOAA Weather Radar Live – Weather Forecast & Storm Alert