All Year Long…Weather to Climate

Statement of Purpose

This year-long project will help students gain experience describing and reporting weather and learn how weather patterns over a long period of time are used to describe the climate of a location. Integrating math and science will enhance my students' understanding because they will be able to develop and use math models (physical graph) which can be applied in both math and science activities. Students will become adept at building feasible arguments and be able to consider how the work relates to a broader issue or context (weather relating to climate). Blending literacy (English Language Arts/ELA) into this integration of math and science helps to build a strong foundation of knowledge based on content rich text which encourages students to read, write and speak grounded in evidence.

Kindergarten students will measure and record daily weather throughout the school year. They will mathematically represent real-world information by organizing their data (weather observations) into simple weather charts and graphs. Kindergarteners measure, with standard (thermometer) and nonstandard units (snap cubes/Lego bricks/Unifix cubes), count and compare to create deeper learning of weather and climate. By analyzing data from weather graphs kindergartners will begin to understand and determine patterns that create climate.

In kindergarten, it is developmentally appropriate to describe temperature using descriptive words: sunny, partly cloudy, cloudy, foggy, windy, rainy, and snowing. Students will also record temperature in degrees (Fahrenheit) and relate the number of degrees with descriptors: very cold, cold, mild, warm, and hot. Kindergartners will learn that weather generates observable patterns over time, and that these patterns help to determine the climate of an area.

Differentiation, in this project occurs by content: multiple print resources, small group instruction, whole group instruction; process: centers, discussion circles; and product: varied modes of expression (drawing, painting, modeling clay/playdough, writing, play)

Learning stations/centers are included in this project because it is a vital element in the kindergarten classroom. Play is the language of the kindergarten classroom; hence children learn through play. Learning stations/centers allow students to play by taking risks and challenging themselves, exploring what interests them, making sense of the real world through role playing, and developing 21st century skills (communication, creativity, collaboration and critical thinking) by working together/playing with their peers.

The teacher's role during center time is to facilitate the children's activities. He/she will encourage discussion, listen, and ask questions without being intrusive. The teacher will share his/her knowledge, help children to make connections and discoveries, give

directions, and encourage participation and perseverance. There is a lot of art involved during learning stations/centers. Art and play skills are aligned with 21st century skills which are needed in our technologically advancing world.

Time

This activity spans the school year.

•Part 1: One (45-50 minutes) class period

•Part 2: 3-5 minutes each day throughout the school year

•Part 3: Half a class period (20 minutes) each month

•Part 4: One class period (45-50 minutes) at the end of the school year

•Part 5: One class period (45-50 minutes) at the end of the school year

Standards

Next Generation Science Standards

NGSS PE K-ESS2-1: Use and share observations of local weather conditions to describe patterns over time.

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

NGSS DCI ESS2-D: Weather and Climate

NGSS Crosscutting Concept: Patterns

NGSS Science and Engineering Practices:

•Analyzing and Interpreting Data

•Obtaining, Evaluating, and Communicating Information

•Engaging in an Argument from Evidence

Common Core State Standards

CCSS.MATH.CONTENT.1.MD.C.4 Represent and interpret data.

CCSS.MATH.CONTENT.2.MD.D.10 Represent and interpret data.

CCSS.MATH.CONTENT.3.MD.B.3 Draw a scaled bar graph.

ELA/Literacy –

RI.K.1 With prompting and support, ask and answer questions about key details in a text. (K-PS2-2)

SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-PS2-2)

New Jersey Learning Standards

Art --

● 1.5.2.Cr1a: Engage in individual and collaborative exploration of materials and ideas through multiple approaches, from imaginative play to brainstorming, to solve art and design problems.

● 1.5.2.Cr1b: Engage in individual and collaborative art making through observation and investigation of the world, and in response to personal interests and curiosity.

Essential Questions

Does weather add up to climate?

What patterns emerge from observing daily weather?

What makes a weather pattern?

What is weather?

What is climate?

What tools do we use to measure weather and how do we use the tools?

How can we show each day's weather?

Does the weather effect the way our graph changes?

Objectives

The students will learn how senses and instruments can be used to describe weather

and that patterns of weather over a long time are called climate.

The students will build a physical graph using snap cubes/Lego bars/Unifix cubes to represent daily weather.

The students will make a graph by coloring rectangular bars which represents daily weather.

The students will engage in individual and collaborative art making that represents types of weather.

Materials

- Elementary GLOBE book*: What in the World Is Happening With Our Climate?*
- Weather Adds Up to Climate Student Activity Sheets:

  #1 – *Bar Graph (sensory)*

  #2 – Bar Graph (temperature)

  #3 – *This Year's Weather*
  #4 – *This is what I'd bring…*

  The Scientists Working Together Rubric
- Interlocking square plastic cubes (such as Duplo®, Unifix®, or Snap Cubes®)
- Two wood blocks approximately 10 inches long and slightly wider than the plastic cubes
- Hot glue gun
- Weather category labels (page 6)
- Thermometer for measuring air temperature
- Glue sticks
- Scissors
- Three-ring binders
- Colored pencils
- Rulers
- Camera

<u>Books</u>

Weather Forecasting by Gail Gibbons

What in the World Is Happening With Our Climate?,by Beca Hatheway & Stanitski, D

Engage - Part 1: Introduce ways that weather can be described.

Teacher will read the book, *Weather Forecasting,* and ask questions to begin discussion:

1. Ask students why and how they would describe the weather using their senses.

- What types of weather can be seen?
- What can be heard?
- What can be felt?

While discussing senses create and input descriptive words in a class chart. One way to collect data is by using your five senses. The senses are how we take in information. We use our five senses (see, hear, touch, smell, taste) to find out about the world around us: objects and events, their characteristics, properties, differences, similarities, and changes. This type of data is qualitative data. Using descriptive words also develops communication and vocabulary. As a whole group, the teacher will list descriptive words about weather, for each of the senses, on a class chart like the

sample below. With prompting and support the students will provide the descriptive words pertaining to weather. The teacher will encourage use of descriptive words that give specific information and remind students to avoid such words such words as good, bad, pretty, etc.

5 Senses Chart

See 	**Hear** 	**Taste** 	**Nose** 	**Touch** 
wind	sounds	flavors	scents	textures
rain	thunder	sweet	sweet	hot
snow	rain on roof/sidewalk	sour	sour	cold
lighting	hail	fruity	burned	wet
sun	wind	salty		dry
cloud		bitter		humid/damp
fog				warm

2. Ask students where they can find information about the weather and what types of information are communicated in a weather forecast. Teacher and students can refer to the 5 Senses Chart. Together, in a whole group, watch a weather forecast clip and have students discuss the types of weather information the meteorologist communicates. This will segue into a discussion about seasons (four different times during the year with different types of weather) and months. Students can sing the months of the year song and hop up when it is their birth month. It's a great way for students to learn the months of the year.

3. Teacher will tell students that, as a whole class, they will measure aspects of the weather each day, such as temperature, rain, snow, and wind. They will use their senses for some weather observations and a thermometer for temperature.

4. Teacher will show students how to take a reading on the thermometer that measures air temperature.

5.Teacher will introduce the bar graphs and explain what students will do each month with sensory weather descriptions and temperature measurements. On the first day, the teacher will make the observations in a whole group, demonstrating for students how to add snap cubes/Lego bars/Unifix cubes to the block. Teacher will explain to students that there may be more than one weather condition to consider on an average day (for example, hot and sunny, or cold and windy). Students may have to add more than one block to the weather graph for one day of weather.

Explain - Part 2: Describe the weather each school day.

1.Designate a student to collect the weather measurements each day:

He/she will color a rectangular bar on the large weather sensory graph (see below); take a temperature measurement using the thermometer and add a snap cube/Lego bar/Unifix cube to the weather bar. Teacher will help the student to read a thermometer. Student will then point out the temperature on the large picture of a thermometer for the whole class to see.

2.Throughout the school year record the weather conditions at around the same time each day that school is in session. Data will not be recorded over the weekends, holidays, or snow days.

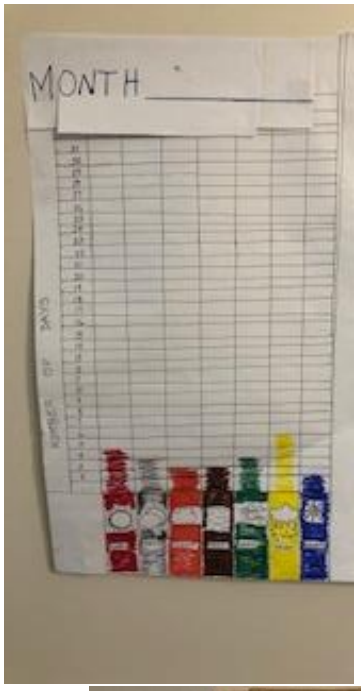
Explain - Part 3: Make monthly summaries.

1. At the end of each month, have students draw the bar graph of their weather observations on a copy of Weather Adds Up to Climate Activity Sheet 1 (for the sensory weather) and Weather Adds Up to Climate Activity Sheet 2 (for temperature).

2. Have students add their monthly graphs to their science journals.

3. Take a photo of the block bar graph each month before dismantling it and starting over the next month. Also take photos of the large sensory bar graph and temperature bar graph. Use the photos as a reference when you are reviewing students' activity sheets. Print photos and place them in a binder or create a big book with the large chart papers. Students will refer to the class book throughout the year.

Sensory Bar Graph



Block Bar Graph

Sensory and block bar graphs are color coded. Visually it would be easier for students to use the sensory data to create the block bar graph. It would be helpful to place the sensory and block bar graph separate from the temperature bar graph.

Temperature Bar Graph

To help students learn how to read temperature from a thermometer, give each temperature label a different color and then add the same colors to your thermometer and bar graph. Encourage students to find the number of degrees and then look to the color to identify which category that temperature fits within.

Explore - Part 4: Investigate patterns of weather to learn about the climate.

1. Towards the end of the year, watch video, What's the difference between weather and climate? and discuss. Look at the photos of the monthly class graphs (sensory, block and temperature). Have students take out the photos and group the monthly graphs by the ones that have the coldest weather and the warmest weather, or most rain/most snow and the least rain/least snow. Teacher will ask students to share the patterns they see on Weather Adds Up to Climate Activity Sheet 3. Students will have the option to discuss the patterns or complete, in writing, activity sheet #3.

2. Tell students that patterns of weather over a long time are called climate. Provide examples from your location. (For example, a pattern of warm weather in the spring and summer is common in New Jersey, New York, and Connecticut.) In contrast, scientists take the weather observations over 30 years to define an area's climate.

Extend - Part 5: Compare weather patterns (climate) in different locations.

1. After reading and discussing the Elementary GLOBE book*, What in the World is Happening to our Climate?* Discuss the connection between weather and climate. Weather is a specific event—like a cold day or a snowstorm—that happens over a short period of time and it can change throughout the day. Weather can be tracked within hours or days. Unlike weather, climate is the average weather conditions in a location over an extended period (30 years or more). Pair students up and give them each a copy of Weather Adds Up to Climate Activity Sheet 4 (This is what I'd bring…), scissors, and a glue stick. Explain to students that they will discuss and decide, with their partner, how to sort the items on their Venn Diagram (students are familiar with Venn Diagrams). Remind students of the two places that Simon, Anita, and Dennis (main characters) travelled: Greenland and the Maldives. There are some items that would be used in colder regions like Greenland, some that would be used in tropical regions like the Maldives, and some used in both places. It will be up to the student pair to decide about the placement of the items on Activity Sheet 4.

2. Have students cut out all the pieces of gear and place them on the Venn Diagram, discussing each piece of gear and deciding where it should be placed. Once pairs decide on the final location of each picture, they will glue the pictures onto the page. Encourage each student pair to discuss why they are putting a picture in a specific place. Students who are capable will write, using phonetic spelling, the name of each item under the picture.

3. After the Venn Diagram has been completed, the student pair becomes a student square by joining another group. Have each group of four students compare and contrast their Venn Diagrams and engage in further discussion.

4. Teacher can have students compare weather and climate between locations that are completely different like New Jersey and Nevada or Florida and Washington State; study the impact of climate on trees; the impact of climate on clothing worn in a specific location and/or create snowman glyphs-all based on weather data.

Learning Stations/Centers for Weather Exploration

Dramatic Play: Teacher will stock center with items used for various types of weather. Students can explore items, sort items, and then create labels for each basket/container assigned to specific items. For instance, all snowy-day items would go into the basket/container labeled "snowy". Teacher will also include pictures of people using weather props to prompt students' play. Encourage ESL (English as a Second Language) students to pair up with non-ESL students so that they can support one another during pretend play. ESL students are more likely to experiment with language in this non-threatening setting.

Science Center: Teacher will provide set of materials separately for each activity based on the weather, monitor activity, and assist when needed.

- rain gauge - ruler, clear plastic jar, water table/tub with watering cans, water for making rain or student can put clear plastic jar outdoors to catch rain then measure.
- wind – small battery-operated fan, drinking straws, various light items (windsock, feathers, tissue paper, pom-poms, etc.)
- snow - materials to make snow such as baking soda, conditioner, instant snow, or real snow
- rain stick - paper towel or wrapping paper tube), aluminum foil, small dried lentils, unpopped popcorn, dry rice, or tiny pasta, tape, scissors, crayons, or markers; pour some dry lentils, dry rice, or unpopped popcorn into tube. The tube should only be about 1/10 full, crunch aluminum foil pieces into long, thin, snake-like shapes then twist each one into a spring shape and put into paper tower tube, cover each end and tape shut, decorate the outside of tube.

Art Center: Students will view weather images at NASA Space Place - Slyder weather images) as inspiration for their own art projects. Teacher will provide paint (watercolors and tempera), crayons, markers, colored pencils, paper, modeling clay, playdough, easel, and other art materials for students to make their own weather art. Students can group artwork by weather type and the teacher will hang in the classroom.

Game Center: Teacher will provide a mixed set of pictures related and unrelated to weather, set up a chart or felt board to help children visually sort pictures. Students will play NASA's Climate Trivia game to test their knowledge of weather and climate. Teacher will read the questions to students. The students can play in teams or individually. Teacher will also provide weather related puzzles and board games.

Literacy Center: Include lots of weather-related books for children to read such as Snowflake Bentley, Hide and Seek Fog, Come on Rain! Geoffrey Groundhog Predicts the Weather, Thunder Cake, It Looked Like Spilt Milk, Snowy Day, Gilberto and the Wind, Oh Say Can You Say What's the Weather Today, etc. Have digital read-alouds and magazines (e.g. National Geographic Kids, Kids Discover-Weather, etc.) available for students. Writing paper (lined and unlined), pencil, and other writing materials will be available for students to write about the weather.

Evaluate

Diagnostic-Listen to students' responses/discussions during engagement portion of project.

Formative - Circulate the room during the Venn Diagram activity, stopping at each pair of students to listen to their discussion about why and where they have placed the pictures on the Venn Diagram and/or to guide students who need help with this process. Listen to student responses about using their senses to describe weather.

Summative - Have each student consider how he/she worked in a group with other scientists using the Scientists Working Together Rubric. Have students rate themselves

individually. Be sure to introduce the rubric by telling students that it should be used to document their experience as a scientist today. Remind them that there is no right or wrong answer. Compare students' monthly bar graphs (sensory and temperature) to photos taken of monthly bar graphs.

Scientists Working Together Rubric	**1 My skills are developing.**	**2 My skills are showing progress.**	**3 My skills are right on target.**	**4 My skills are on target and I was able to help others.**
Contributing Ideas	I was quiet in my group/with my partner/peers and listened to others talk.	I listened to others and either asked a question or made a comment.	I listened to others, asked several questions, and made comments.	I listened to others, asked several questions, and made comments. I also helped other voices be heard in the group.
Participating in Group	I listened to my group/partner/peers and decided to keep my thoughts to myself.	I shared briefly with my group/partner/peer. If I had disagreements they sometimes turned into arguments.	I took turns sharing with my group/partner/peers and any disagreements were done respectfully.	I was able to work respectfully with my group members/partners/peers, and was able to help moderate the participation of others if needed.
Staying on Topic	My mind was on other topics instead of our group discussion.	I was able to focus on our group/partner/ peer topic for a short time during our group discussion.	I was able to focus on our topic for the entire group discussion.	I was able to focus during our entire group discussion, and helped others stay focused too.

Sources

Hatheway, B. & Stanitski, D. *What in the World is Happening to our Climate?* Elemantary GLOBE. NASA. https://www.globe.gov/web/elementary-globe/overview/climate

NASA ClimateKids. *Climate Trivia* [Computer game]. Retrieved June 24, 2020, from https://climatekids.nasa.gov/trivia/

NASA ClimateKids. Rainsticks and folklore [activity]. Retrieved June 30, 2020, from https://climatekids.nasa.gov/rainstick/

NASA ClimateKids. "What's the difference between Weather and Climate." [video file]. Retrieved on June 26, 2020, from https://climatekids.nasa.gov/weather-climate/

NASA Space Place. "Slyder Weather Images. Retrieved on July6, 2020 fromhttps://spaceplace.nasa.gov/weather-slyder/en/#/review/weather-slyder/text-version.html

"*Weather adds up to Climate*." Elementary GLOBE. Retrieved on June 22, 2020, from https://www.globe.gov/web/elementary-globe/overview/climate