

THE IMPORTANCE OF WEATHER PREDICTION

STUART OGBURN, NORTON PARK ELEMENTARY SCHOOL

Unit Overview

In this project-based learning unit that integrates, science, technology, engineering, the arts, and mathematics, students investigate how meteorologists measure and forecast the weather by engineering weather instruments, collecting and analyzing weather data, and producing a weather forecast. Throughout the unit students collect weather data using student-engineered weather instruments. Students then analyze and graph their data and utilize technology to develop a weather map. Finally, students create a script on the predicted weather patterns, record a weather forecast, and use editing software to finalize their videos.

Standards Addressed

1. **TAES.4.2:** Developing scripts through improvisation and other theatrical methods.
 - c. Researches and incorporates a variety of media into a script
 - d. Creates in-depth scripts that include character motivation and dialogue
 - e. Creates an organizing structure for writing scripts
2. **TAES.4.3:** Acting by developing, communicating, and sustaining roles within a variety of situations and environments.
 - a. Uses articulation, volume and vocal variety to communicate thoughts, emotions and actions of a character
 - b. Uses stage areas and body movement to communicate thoughts, emotions, and actions of a character
 - c. Uses imagination and real life experience to portray characters
 - d. Collaborates with an ensemble to create theatre
3. **TAES.4.4:** Designing and executing artistic and technical elements of theatre.
 - a. Uses technical theatre elements to design simple costumes, props, sets, sound and lighting
 - b. Incorporates technical theatre elements into theatre experiences
4. **ISTE.S.1:** Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology.
5. **ISTE.S.2:** Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.

6. **ISTE.S.3:** Students apply digital tools to gather, evaluate, and use information.
7. **ISTE.S.4:** Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
8. **ISTE.S.5:** Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
9. **ISTE.S.6:** Students demonstrate a sound understanding of technology concepts, systems, and operations.
10. **M.4.MD.1:** Know relative sizes of measurement units within one system of units.
11. **M.4.MD.4:** Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Solve problems involving addition and subtraction of fractions with common denominators by using information presented in line plots.
12. **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.
13. **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.
14. **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.
15. **S.4.E.4:** Students will analyze weather charts/maps and collect weather data to predict weather events and infer patterns and seasonal changes.
16. **S.4.CS.2:** Students will have the computation and estimation skills necessary for analyzing data and following scientific explanations.
17. **S.4.CS.3:** Students will use tools and instruments for observing, measuring, and manipulating objects in scientific activities utilizing safe laboratory procedures.

Day 1 – The Importance of Weather Prediction

Standards Addressed: 12, 13, 14, 15, 17

Essential Question: What is the importance of weather prediction?

1. Take the students outside and explain to them how people have been forecasting the weather for thousands of years. As a class, create a list of observations about weather (e.g., clouds, temperature, wind, etc.).
2. After returning to the classroom, explain that the most basic way to observe weather is through the five senses. Then, using the list of observations, ask the students what they predict the weather will be like tomorrow.
3. Watch the linked video about [weather prediction](#). Then, explain to the students why predicting the weather is important and how meteorologists and engineers use modern tools to predict the weather.
4. After the video, introduce the **Creating a Weather Station and Forecast Project (Part 1)**.
 - **Overview:** Students will engineer a weather station in order to collect weather data. The station will include a *wind vane* to measure wind direction, an *anemometer* to observe wind speed, a *thermometer* to measure temperature, a *barometer* to observe air pressure, and a rain gauge to measure rainfall. Students will then use the data collected to record a forecast segment.
 - **Student Scenario:** *Today, you will become an engineer and a meteorologist! You and seven other friends have created a news station in Atlanta and it is your job to provide a weather forecast for the upcoming holiday weekend. Thousands of people will be traveling to the city to enjoy the festivities. It is the news station's job to observe weather patterns and design weather forecasting equipment in order to generate a forecast that will be played on the news. It is up to the news team to determine if the weather will be safe and pleasant to enjoy the holiday festivities.*
5. Divide the class into news station teams (eight students per group) and have them create a news station name. Then, have students design a poster with their news station name and logo to be displayed at each group's workstation throughout the duration of the project. Finally, distribute the **Weather News Station STEAM Project Rubric** to each group.
6. **Closing:** With a partner, have students discuss the following questions:
 - Why is it important to predict the weather?
 - How do you think the weather is predicted?

Day 2 – Engineering Weather Instruments

Standards Addressed: 12, 13, 14, 15, 17

Essential Question: How do meteorologists use tools to predict the weather?

1. Play the following [Weather Instruments Song](#).
2. Explain to the students that scientists use many different tools to predict the weather. Show the following video about [Weather Instruments](#). Frequently pause the video and discuss each instrument with students.
3. Continue working on the **Creating a Weather Station and Forecast Project (Part 1)**.

- Explain to students that each group will be engineering weather instruments including a rain gauge, a wind vane, an anemometer, and a barometer.
- Next, have students select partners within their groups. Instruct each subgroup to decide which weather instrument they would like to engineer. Partners within each group should choose different instruments in order for each group to have a complete weather station. The teacher can also choose to have all eight students work together to create the weather station.
- Have the students conduct research on their instrument using computers, articles, and pictures. Using the resources, encourage students to figure out how the instrument works to gather data about the weather.
- Next, provide students with a variety of materials to build their instruments. Have students sketch the weather tool they are engineering and label the materials they plan on using *before* building the instrument.
- Gather large crates or bins to store each group’s materials at the end of the work period. These bins will also serve as the housing unit for each of the tools and will eventually become the weather station.

A NOTE FROM THE TEACHER

The goal of this project is for students to truly engineer their own instruments. In other words, they should construct the instruments without step-by-step instructions. Also, they should problem-solve and draw conclusions on their own, emulating a true engineer. The teacher should facilitate the construction of the instruments and offer suggestions and ideas for students to be successful. However, if students are struggling, the teacher may provide them with [step-by-step instructions](#) or videos. The teacher may also want to be familiar with a variety of ways to build the instruments, in order to best facilitate learning.

4. **Closing:** Have students share the sketch of the instrument they engineered. Offer suggestions or thought-provoking questions on how to improve the instruments.

Day 3 – Engineering Weather Instruments

Standards Addressed: 12, 13, 14, 15, 17

Essential Question: How do meteorologists use tools to predict the weather?

1. As a large group, review the temperature by using the interactive tool through [UCAR Center for Science Education](#). Lead the students into a discussion about molecular movement and temperature.
2. Continue reviewing weather instruments by visiting the following site: [Study Jams](#). When finished, take the quiz with students to check for understanding.
3. Allow for the students to continue their work on the **Creating a Weather Station and Forecast Project**.
4. **Closing:** Go around the room and ask students what one of the weather tools measures. If they are having difficulty, have them listen to several other students and then try again.

Day 4 – Analyzing a Weather Map

Standards Addressed: 12, 13, 14, 15, 16, 17

Essential Question: Why do meteorologists use maps to predict the weather?

1. View the following [Study Jams](#) site about identifying outcomes and making predictions. Lead the students through the quiz as a check for understanding, after completing the site content.
2. As a large group, show the **Forecasting Weather PowerPoint**. With guidance from the presentation, teach the students how to read and analyze the different weather maps. Have students predict what each map is forecasting and teach them how the symbols are used to represent different types of weather.
3. Allow for the students to continue their work on the **Creating a Weather Station and Forecast Project (Part 1)**. Students should be able to finish engineering a weather instrument. Instruct the class to affix the weather instruments to their bins, in order to create the weather station. Then, if possible, provide each station with a thermometer if possible.
4. **Closing:** Have the students complete the **Weather Instruments Sort Activity Sheet**.

Day 5 – Predicting the Weather and Collecting Data

Standards Addressed: 10, 12, 13, 14, 15, 17

Essential Question: Why do meteorologists collect data on the weather?

1. Listen to the following [song](#) about weather. Encourage the students to participate in the dance movements.
2. Show students the [current weather map of the United States](#) and ask students to make observations about the current weather. Next, enter your zip code in the upper right hand corner to look at your local weather and forecast. Show students the different features of the website such as the radar, clouds, and weather in motion sections. Also, show students the hourly and five-day forecasts. Ask students questions such as: “How do you think meteorologists predict the weather?” “What direction do the clouds, precipitation, fronts, etc... seem to move?” “How does the direction of the clouds, precipitation, fronts, etc... help meteorologists predict the weather?”
3. Allow for the students to continue their work on the **Creating a Weather Station and Forecast Project (Part 1)**.
 - Have students take their weather stations outside and collect data using the instruments they created. Discuss with students how the instruments measure data differently, and how the units may vary.
 - Teach students how to read the different measurements and convert them into the appropriate units on the **Weather Data Recording Sheet**. They should use the recording sheet over the next several days.
 - Ask students questions such as: “Why do you think meteorologists collect data on the weather daily?” or “How is collecting weather data related to forecasting the weather?”
 - Have students predict what they think the weather will be like tomorrow. Instruct them to provide reasoning to support their conclusions.
4. **Closing:** Have pairs or groups of students compare the data they collected. Give them time to discuss the similarities and differences they recorded. Then, share out as a large group.

Day 6 – Predicting the Weather and Collecting Data

Standards Addressed: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 16, 17

Essential Question: Why do meteorologists collect data on the weather?

1. Take the students outside to collect weather data. Review the processes to read data and convert units. Have the students reflect on whether or not their predictions about the weather were correct. Allow them to make new predictions for the next day.
2. Have the students go on the [virtual field trip](#) to 11 Alive News Weather Station in Atlanta where Chesley McNeal is interviewed about what it is like to be a meteorologist.
 - Consider using the links and activities found within the [Glogster](#) to further teach students about weather.
3. Introduce the **Creating a Weather Station and Forecast Project (Part 2)**.
 - Explain to the students that they will write a script based on their reporting and predicting of weather. Also, explain to the students that they will create a weather map that accompanies the script.
 - Explain to the students that they will record their script, using a green screen and the weather map, and then edit the video. Show the students a few examples of weather forecasts online, such as the following [clip](#).
 - Take a moment to cover the expectations from the **Weather News Station STEAM Project Rubric**
4. Instruct the students to begin writing their scripts and forming their maps using appropriate technology (e.g., iMovie, DoInk, Windows Moviemaker).
5. **Closing:** Have the students discuss questions such as: “What is a meteorologist?” and “What makes a meteorologist’s job important?”

A NOTE FROM THE TEACHER

If you do not have access to a green screen, no need to fear! A great alternative is for students to create a PowerPoint with the different backgrounds that go along with their script. Students can then record themselves standing in front of the projected images.

Day 7 – Air Pressure

Standards Addressed: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 16

Essential Question: What is air pressure and how does it change the weather?

1. Repeat the opening outdoor activity from the previous day.
2. As a large group, watch the following [video](#) about air pressure. Then, instruct the students to take the associated quiz.
3. Prepare one of the following [experiments](#) that demonstrate air pressure. Discuss the definition of pressure and the different types of weather that accompany it. Also, discuss the symbols associated with each type of pressure. Encourage the students to use these symbols on their weather maps.
4. Allow for the students to continue their work on the **Creating a Weather Station and Forecast Project (Part 2)**.
5. **Closing:** Perform a 3-2-1. On an index card or post-it, have students list 3 things that they learned, 2 things that they have questions about, and 1 thing that they want the teacher to know.

Day 8 – Fronts

Standards Addressed: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 15, 16

Essential Question: What are the different types of fronts and how do they change the weather?

1. Repeat the opening outdoor activity from the previous day.
2. As a large group, watch the following [video](#) about fronts. Then, instruct the students to take the associated quiz.
3. Lead a discussion about the types of weather that each front brings. Ask the students if a front is currently or has recently been in the area. If yes, ask them to identify the type of front that occurred.
4. Allow for the students to continue their work on the **Creating a Weather Station and Forecast Project (Part 2)**.
 - Have students finish up writing their scripts and finalizing their maps. Provide time for them to practice acting their scripts and memorizing their lines. Encourage them

to use articulation, volume, and vocal variety to articulate thoughts, emotions, and actions. Additionally, encourage the students to use the appropriate body movements.

- Have students prepare props that will be used in their skits (e.g., weather instruments they created, a microphone, etc.). Also, encourage the students to dress appropriately – using costumes if needed – for the filming of the skit.
5. **Closing:** Instruct the students to draw a Quick Doodle. Have students depict either a warm or cold front and the type of weather associated with each.

Day 9 – Predicting the Weather and Collecting Data

Standards Addressed: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 15, 16

Essential Question: What are the differences between weather and climate?

1. Repeat the opening outdoor activity from the previous day.
2. Complete the [Interactive Line Plot](#) with the students. Then, have each group create line plots on a piece of chart paper using the data they collected. For instance, if students are plotting temperature, have them plot the different temperatures that each person observed, in order to see the most frequent temperature over the past week. Furthermore, have students calculate the range of temperature. Lead the class in sharing out their line plots. Take this time to discuss similarities and differences.
3. Watch each of the following videos: [Climate vs. Weather Video 1](#) and [Climate vs. Weather Video 2](#). Then, lead the students to investigate the climate of Georgia through the following [link](#). Have students compare these data with what they graphed earlier.
4. Allow for the students to continue their work on the **Creating a Weather Station and Forecast Project (Part 2)**.
 - Have the students record their scripts. Then, start editing the movie using apps such as iMovie, Moviemaker, Loopster, or Magisto.
 - Encourage the students to film each scene as a separate clip so that it will be easier to edit later (e.g., splice together, add transitions, add text, etc.).
5. **Closing:** Provide an exit ticket for students to form a definition of both weather and climate, in their own words.

Day 10 – Conclusion

Standards Addressed: 1, 2, 3, 4, 5, 6, 7, 8, 9, 15

Essential Question: Why is predicting the weather important?

1. Instruct the students to finalize their videos. Then, play the videos as a large group. Consider uploading the videos to YouTube or sending them to a local news station. Be sure to obtain parental approval.
2. Lead a discussion with students about why tools are important when predicting the weather. Also, have the students provide an overall reflection about the importance of predicting weather.

A NOTE FROM THE TEACHER

Publishing the videos outside of the classroom makes the project more authentic. It gives students a purpose and allows them to make real-world connections.

Differentiation

Product	The product can be varied by: <ul style="list-style-type: none">• Allowing students to choose which instrument to make; or• Allowing students to work alone or in small groups on their products.
Process	The process can be varied by: <ul style="list-style-type: none">• Breaking the students into ability groups;• Assigning students a weather instruments to build, or providing them with videos and step-by-step instructions. Struggling students may need to build a rain gauge while advanced students may build the barometer;• Developing task lists written by the teacher to be completed during each class period; or• Varying the length of time a student may take to complete the project.
Content	The content is varied through: <ul style="list-style-type: none">• Videos;• Conducting research through the web, articles, and pictures;• Virtual Field Trips; and• Interactive Games.
Learning Environment	The learning environment can be varied by: <ul style="list-style-type: none">• Ensuring there are quiet places around the room for students to work and other places around the room for collaboration; or• Developing routines for students to get help when teachers are busy with other students.