Activity 2.1: Weather or Not

Grades 5 – 6

Description: Part 1: Weather vs. Climate, students will learn the difference between climate and weather by using scenario cards, and by creating and presenting skits that illustrate climate or weather.

In Part 2: Measuring the Weather, students will use thermometers and other weather instruments to make observations and measurements of weather.

In Part 3: Our Weather and Our Climate, students compare the weather data they have collected with data on their local climate and consider how closely daily weather patterns match the expected climate.

Total Time: Two to three 45-minute class periods (45 minutes for Part 1, about 10 minutes each day for the following week to record weather observations (Part 2), another 45 minutes for Part 3).

Materials:

Part 1

- Weather and climate cards
- (Optional materials for skits, e.g. beach ball, snow shovel, gloves, sun hat, umbrella, etc.)

Part 2

- Copies of the "Daily Weather Observation" datasheet
- Thermometers, one per group (Optional other weather data collection equipment) •
 - Notebooks

Part 3

- Copies of the "Our Weather and Our Climate" worksheet
- Copies of the "Weather Resources on the Web" instruction sheet
- Printouts of average temperature
- Computers with web access for student research
- Graph paper, one piece/student
- Colored pencils, one package/group

Prior Knowledge

- Calculating averages
- Multiplying with fractions to convert from Fahrenheit to Celsius (you may want to do this as a whole group if your students have not yet studied fractions).

National Science Education Standards

A1.C Use appropriate tools and techniques to gather, analyze, and interpret data.

D3.B The weather is always changing and can be described by measurable quantities such as temperature, wind direction and speed, and precipitation.

AAAS Benchmarks

- **4B/E5:** The weather is always changing and can be described by measurable quantities such as temperature, wind direction and speed, and precipitation.
- **4B/M14**: Earth has a variety of climates, defined by average temperature, precipitation, humidity, air pressure, and wind, over time in a particular place.

Guiding Questions

- What is the difference between weather and climate?
- How does the weather outside relate to our local climate?
- Can we identify climate trends by looking at daily weather?

Assessment(s)

• Our weather and our climate worksheet

Resources:

- http://www.global-greenhouse-warming.com/climate-weather.html
- NASA information on the difference between weather and climate, http://www.nasa.gov/mission_pages/noaa-n/climate/climate_weather.html
- NOAA information on the difference between weather and climate, <u>http://oceanservice.noaa.gov/facts/weather_climate.html</u>
- Kid friendly information on the difference between weather and climate, <u>http://www.weatherwizkids.com/weather-climate.htm</u>
- Also see the Weather Resources on the Web handout, p. 9 of this activity.

Part 1: Weather vs. Climate

Procedure:

- 1. Open with a discussion about weather and climate. Write the terms "Weather" and "Climate" on the board. Ask students to come up and write a phrase or a word about these words. Attempt to form a class definition of weather and climate. For example: The weather is the condition of the atmosphere and how it changes over a short period. Climate is the effect of the weather over a whole area or country for a definite longer period of time. Resource: http://www.global-greenhouse-warming.com/climate-weather.html.
- 2. Have students work in pairs. Each pair of students will receive two cards. Students will work together to determine whether each card describes weather or climate.

Note: a pair of students can have two weather cards, two climate cards, or one of each. They should not assume that if one of their cards is weather, the other is climate.

- 3. When all groups have decided whether their cards describe weather or climate, have the students read their set of cards to the class, and explain their choice.
- 4. Then, students should be challenged to create a "scene" (a very short skit) that represents weather, and another that represents climate.
- 5. You may choose to have a few groups present their scenes to the entire class or you can bring two pairs of students together, so they are in groups of four. Have each pair present their scene to the other, and have them determine which scene represents weather and which represents climate. As an alternative, students can create pictures or stories that represent weather and climate.
- 6. To close the activity, review the students' working definitions of weather and climate on the board. Clarify that weather is a single event and climate is the average of multiple weather events over time.



Part 2: Measuring the Weather

Procedure:

- 1. Tell students that they will be recording the weather each day for ten days, and that they are going to start today. Together with the students, develop a list of questions that they can answer each day about the weather (Examples: Is it cloudy? Is it sunny? What is the temperature? Is it raining or snowing? Is it windy?). You may want to write their questions on a poster-board and have them displayed in the classroom.
- 2. Divide students into groups and give the handout "Daily Weather Observations" to each student. Give each group a white piece of construction paper or notepaper and one thermometer. Bring students outside and have them choose locations outside in the sun. They should put their thermometer on the white piece of paper and wait five minutes. While they are waiting, they can make other observations about the weather based on the list of questions they generated in the classroom. If you have access to a weather station, you may also include quantitative measures of precipitation, or you can use the local weather report for this information.

The first set of observations should be made outside as a class, either divided into groups or as a whole class activity. Subsequent observations and measurements can be made by any of the following methods:

- Sending one group of students out to collect the data for the class each day
- Using a window thermometer in the classroom and making observations through the window
- Collecting data as a class outside each day
- Collecting data in groups outside each day
- 3. Have the students write down their first day's observations, and continue to make observations throughout the week. They should collect weather data each weekday for at least two weeks.
- 4. Once students have collected at least ten days' worth of weather data, you can complete Part 3.

NOTE: If you like, you can supplement student collected data with weekend weather data from a local newspaper or weather station. You may also have students collect weather data at home on the weekend and use that for a discussion of how temperatures may be slightly different in different locations based on different conditions.

Part 3: Our Weather and Our Climate Before starting the Activity

- Reserve the computer lab
- Ensure students are familiar with converting from Fahrenheit to Celsius. Most of the websites use Fahrenheit, so students will need to do the math to convert temperatures. They may also use a web-based temperature converter. (°F -32) x 5/9 = °C

• Become familiar with the websites listed on the "Weather Resources on the Web" information sheet. Choose the city and state closest to your school. If students are not going to be using computers to do their research, print out monthly average temperature data, monthly average high/low temperatures, daily average high/low temperatures, and record high/low temperatures. Make one packet of this information for each group of three to four students.

Procedure:

- 1. Introduce the activity by telling students that they are now going to compare the weather data they have been collecting with historical weather data. They are going to look at how day-to-day weather patterns are like, or are different from, the overall climate.
- 2. Begin by calculating the average ten-day temperature for student data. Depending on how students have collected the data (in groups or as a class) they may have somewhat different temperature values for each day. If you have multiple values for each day, you can create a table on the board and calculate the average recorded temperature for each day, and then a class ten-day average.

NOTE: Question 3 on the "Our Weather and Our Climate" worksheet has students calculate the ten-day average of their data. You may have students fill in the class average, or you may have them calculate the average for their individual group. Similarly, for Question 1 on the worksheet, you may have students graph the daily averages from the class discussion or have them graph the data that each individual group collected.

- 3. Ask what time of day they collected their data. Ask students whether it makes a difference **when** during the day they record the temperature.
 - Is it hotter at some times of the day than others?
 - Do they think when they collected the data will affect their results?

Introduce the idea of average high and low temperatures. Do they think their data will be closer to the average high or average low? (Generally, if they collect data in the morning, it will be closer to the low, and if it is in the afternoon, closer to the high.)

- 4. Ask students what would happen if you took the temperature every hour for 24 hours.
 - If they averaged that, what would be the result?
 - What would that kind of information be used for?

Introduce the idea of average daily temperature.

- 5. Tell students that they are now going to compare the data they collected with average temperature data for their region.
- 6. Divide students into groups of three to four. Hand out any printouts of your local climate information and get them set at computers if you are having them do research on the web. Hand out graph paper, the "Our Weather and Our Climate" worksheet, the "Weather

Resources on the Web" sheet, and any other print resources they will be using. Have them get out their weather observation data collection sheets.

- 7. Have students graph the weather data they collected. There are several ways you can have students do this.
 - As a group, you can create a graph using whole class daily temperature averages.
 - Students can work individually to graph their own data.
 - If students worked in groups to collect the temperature data, you can divide them into those same groups and have them create a graph using the group data.
 - You can divide them into groups and have them graph the daily average temperatures you calculated for the class as a whole.
- 8. If your students need more guidance, project the website and walk the students through reading the tables and graphs of average monthly temperatures and precipitation before they break into groups to answer the questions.

NOTE: Most of the websites use Fahrenheit, so students will need to do the math to convert temperatures. They may also use a web-based temperature converter. ($^{\circ}F - 32$) x $5/9 = ^{\circ}C$

9. Discuss students' answers to each of the questions. As you discuss, create group definitions of climate and weather that you will use moving forward. These definitions should include components that describe the potential variation in daily and seasonal weather patterns as compared to long-term climate.



Weather and Climate Cards

1A. I looked out the window and decided to wear shorts.

1B. In July, I always wear shorts.

2A. The average temperature over the last ten years in August is 27 degrees Celsius.

2B. I cannot wait to go swimming at the pool because it is so hot!

3A. It has not rained yet this month.

3B. Typically, rainfall in June is less than **2.5** centimeters.

4A. It snowed 12.7 centimeters last night.

4B. The average snowfall in a Chicago winter is 96.5 centimeters.

5A. Katrina was the strongest hurricane to hit New Orleans.

5B. It was difficult to walk outside today because of the rainstorms.

6A. This winter should be colder than normal.

6B. The temperature today is 10 degrees Celsius.

7A. The barometric pressure is affecting my headache.

7B. The barometric pressure has fallen over the past 30 years.

8A. At any given moment, there are roughly 2,000 thunderstorms in progress around the world.

8B. There is a severe thunderstorm watch for my county tonight.

9A. It is a nice hot day in May.

9B. It has never gone above 38 degrees Celsius in the month of May.

10 A. We generally get between 25.5 and 30.5 centimeters of rain this month.

10B. The skies are clearing up.

Name: _____ Date: _____ Room: _____

Daily Weather Observations

Date & Time	Weather Observations	Temperature
	Average Ten-Day Temperature	



Weather Resources on the Web

Weather Underground

http://www.wunderground.com/

To get historical weather data for your city:

- Type the city and state into the box labeled "Find the Weather for any City, State, Zip Code, or Country."
- Once the weather forecast appears, scroll about 3/4 of the page until you see the "History & Almanac" box.
- Use the drop-down boxes to choose the date that you began collecting your data.
- Click "View."
- Select the "Monthly" tab for monthly averages.
- Select the "Daily" tab for daily actual, normal, and record temperatures.
- Use the drop-down box to change dates.

Weatherbase

http://www.weatherbase.com/

To find average weather data for your city:

- Type the city and state into the Weatherbase search box at the top of the page.
- Click on the link to your city's weather data.
- If your city is not in the search results, choose the city closest to your school.
- Scroll down to the historical weather averages.
- To convert temperatures to Celsius, click on the "C" button in the top right-hand corner of the data box.

United States Climate Data

http://www.usclimatedata.com/

Average monthly precipitation and average monthly high/low temperatures for many cities throughout the United States. To get historical weather data for your city:

- Click on your state.
- Click on the city closest to your city.

National Weather Service

http://www.weather.gov/

This site has both national and regional maps and data. Regional data includes dates for record high/low temperatures and precipitation.



Name: Date:	Room:
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Our Weather and Our Climate

Answer the following questions using the information your teacher has given you and the web resources listed on the "Weather Resources on the Web" sheet.

Analyzing your temperature data

- 1. Begin by graphing the temperature data you collected. Make sure you label the x and y axes correctly.
- 2. Look at your data. Do you notice any trends? Describe any patterns in the data.
- 3. Calculate and record the ten-day average of your temperature data. _____°F.
- 4. Draw a line through your graph at your ten-day average temperature.
- 5. Compare the temperature for each of the ten days that you collected data to the average temperature. What do you notice?
- 6. Based on your graph, can you draw any conclusions about whether the climate is changing? Why or why not? What other information would you need?

Comparing your data to monthly average temperatures

Use the "Weather Resources on the Web" guide and any print resources your teacher provides to answer the following questions.

- 7. Write the month that you collected your data: ______.
- 8. Find and record the mean (average) temperature for the month that you collected your data.

•F. Using a different color, draw a line through your graph at that

temperature.

- 9. What is the <u>average monthly high temperature</u>? ______°F
 What is the <u>average monthly low temperature</u>? ______°F
 Using different colors, draw lines through your graph at both of those temperatures.
- 10. Compare your ten-day average temperature to the monthly average high and low temperatures? What do you notice? Write down your observations.

Comparing daily temperatures over time

Use the "Weather Resources on the Web" guide and any print resources your teacher provides to answer the following questions.

11. Choose one of the ten days that you collected data.

Write the date here:______and temperature here:_____

12. Using web resources, find the record high and record low for this date:

Record High:_____

Record Low:

13. Using web resources, fill in the table on the right with the actual temperatures recorded for the past five years for the month and day that you have written above.

	Temperatures		
Year	Mean Temp.	Max. Temp.	Min. Temp.

14. Compare the minimum, maximum, and mean temperatures in the table over the past five years. Do you see any trends? Are there any patterns in the data? How do they compare to the record high/low temperatures?

15. Based on the data you collected, and on the historical data you have researched, is it possible for weather in your city to vary considerably from day to day? From "normal" temperature values to record highs and lows? From year to year? What, if anything, does this tell you about whether or not climate change is happening in your city? Explain your answer.

16. Is it possible to form an accurate picture of global climate change from our analysis of temperature in one city? If yes, explain why. If no, explain what other data are needed.

TEACHER ANSWER KEY

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- 3A. It has not rained this month yet. (weather)
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