Everest Education Expedition Curriculum

Lesson 4: What's the Weather?

Created by Montana State University Extended University
and Montana NSF EPSCoR
http://www.montana.edu/everest

Lesson Overview:
Uncover the difference between climate and weather. Using a climate map of the world, explore climate regions around the earth. Compare your hometown climate and weather to that of Mount Everest. See how the expedition dresses for Everest's weather. Use daily online weather resources to record and graph the weather over an extended period of time at home and at the top of the world.

Objectives:
Students will be able to:

1. Compare and contrast weather and climate.
2. Record weather, including temperature in Celsius and Fahrenheit over an extended period of time.
3. Analyze monthly average weather data to determine the best time to climb Mount Everest.

Vocabulary:
anemometer (AN-e-mom-me-ter): a tool used to measure wind speed
Celsius: a unit of measurement for temperature used by most of the world
climate: the weather of an area over a long period
Fahrenheit: a unit of measurement for temperature used by the United States
forecast : a prediction or to make a prediction
humidity: the amount of water in the air measured in percentages
meteorologist: someone who studies, reports, and forecasts the weather
monsoon: seasonal reversing wind accompanied by corresponding changes in precipitation
precipitation: any form of water, such as rain, snow, sleet, or hail that falls to the Earth
thermometer: a tool used to measure temperature
weather: what is happening outside your window at a particular time; the state of the air surrounding the Earth at any given time in a particular place
weather window: a short period of time good for climbing a mountain

Background Information:
Weather and climate are affected by longitude and latitude, nearby bodies of water, mountains, elevation, wind, and even ocean temperatures and currents in faraway places. Mount Everest is greatly affected by the seasonally changing jet stream and **monsoons**, which bring cold air, high winds, and heavy snowfall in all but a few weeks in the late spring and early summer.

The window for good climbing weather on Everest is short and typically occurs in the months of March through May or September and October. At this time of the year the jet stream shifts slightly and winds on the mountain decrease significantly posing less threat to climbers. June begins the monsoon season with heavy precipitation and is a very dangerous time to be on Mount Everest. November though February are relatively dry, again due to a jet stream shift, but extremely cold and not advisable for climbing to the summit.

Daily weather tracking is essential to climbers attempting to summit Mount Everest. Weather can stop even the strongest climbers and make climbing to the summit of Mount Everest impossible. Most Everest expeditions have team members in base camp that relay weather information to climbers high on the mountain to help keep them safe and determine the best time to climb.

Activity 1: Weather and Climate Around The World

Lesson Length: 25 minutes

Materials:

- *Daily newspaper weather page (optional)*
- *Computer with Internet access (optional)*
- *Blank world climate maps (one for each student)*
- *Completed world climate map*
- *Colored pencils*

1. Ask your students to look outside. Is it sunny, cloudy, raining or snowing? Tell them that what they see out the window is the **weather**. It is what we experience everyday and can change very quickly.
2. Discuss and answer the following questions as a class:
    a. How does weather affect our daily lives?
    b. Why did you wear what you are wearing to school today?
    c. Will you be able to wear the same thing in three months? Why?
    d. Will you be wearing the same types of clothes to school the same time next year? Why or why not?
    e. Define what a **meteorologist** does (**forecasts** weather).
    f. What tools do meteorologists use to measure, record and forecast the weather? Include **thermometers** and **anemometers** in this discussion.
3. *(Optional: Show your students local weather forecasts using a daily newspaper or weather website.)*
4. Explain that **climate** covers the weather of a much larger area over a long period of time and that there are many different climates around the world.
5. On the World Climate Map have students use the key to shade in Mount Everest's climate (Highland/Alpine Climate) and their hometown climate using colored pencils. (Find your classification at http://www.theodora.com/maps/new9/world_climate_map-large.jpg).
   Optional: If time allows, shade in the entire map.
6. Explain to your students what defines Mount Everest's climate and the climate zone of your hometown.
    a. Mount Everest is in the Highland/Alpine Climate Zone because of its elevation. It experiences cold weather year round, heavy snowfall, and strong winds.
    b. Montana experiences one of two climate classifications (depending upon location).
        i. Warm continental climate (mountains regions including Bozeman, Missoula, and Kalispell) typified by large seasonal temperature differences, with warm to hot summers and cold (sometimes severely cold) winters.
        ii. Cold semi-arid climate (plains regions including Butte, Helena, and eastern Montana) typified by little precipitation, hot and dry (often exceptionally hot) summers, and cold winters with some snowfall.
7. Compare and contrast with your students the climate of Mount Everest Base Camp and the climate of your hometown through a class discussion. For each of the following

climate factors, have your students identify similarities and differences between Mount Everest and your hometown.

a. Temperature (Average January temperature and average July temperature) *NOTE: Introduce your students to **Fahrenheit** and **Celsius** measurements at this time if they are unfamiliar with these units.*
b. Wind (Month with highest winds, month with calmest winds)
c. **Precipitation** (Month with highest precipitation, month with lowest precipitation)
d. Elevation
e. Latitude
f. Nearby water

Optional: This comparison can be completed directly on the "Mount Everest and Me" worksheet or as a Venn Diagram.

Activity 2: What to Wear?

Lesson Length: 5 minutes

Materials:

- *Photographs of Everest Expedition outfits available at* http://www.montana.edu/everest/multimedia/index.htm#clothing_photos.

1. Tell your students that the weather changes rapidly on Mount Everest and varies with elevation. Climbers in Base Camp can experience extremely different weather than climbers on the summit. The summit of Mount Everest is harsh and experiences extremely cold and windy weather. Tell your students that just like they wear different clothing in the summer than they do in the winter, climbers must bring different clothes to wear in different weather conditions.
2. With your students, watch a video of Conrad Anker as he materializes from behind the layers of clothing needed to summit Mount Everest. See Conrad's down suit, mittens and boots. *http://youtu.be/3vImNA_4qLQ*
   Ask your students what clothing Conrad has that is similar to their winter clothing.
3. Show your students pictures of different outfits Mount Everest climbers wear to stay warm including clothing that is very different than what Conrad was wearing in the video. *http://www.montana.edu/everest/multimedia/index.htm#clothing_photos*
4. Discuss how different clothes can protect the climbers in each environment they are in.
   a. Down suit, goggles, big mittens, etc. (Mount Everest summit)
   b. Baseball hat, light (or no) jacket, pants, and no gloves (trek to Base Camp or Base Camp on a warm sunny day)
   c. Jacket, gloves, gaiters (Climbing on a warm day or at lower elevations)
5. Ask your students to share if the clothing they wore today matches the weather and reflect upon how people, regardless of where they are, dress for the weather.
6. Ask your students what they think of the photos of Conrad wearing clothing similar to what George Mallory and Sandy Irvine wore in the early 1920s when attempting to climb Mount Everest.

Activity 3: When Should You Climb Everest?

Lesson Length: 15 minutes

Materials:

- *"When Should You Climb Everest?" worksheet* *http://www.montana.edu/everest/resources/worksheets/Worksheet_WhenShouldYouClimb.pdf*

- *Pencils*

1. As a class, examine and analyze the data on the "Average Everest" worksheet. Look at each of the weather factors independently.
    a. Look at the average temperature tables. Ask your students if it would be best to climb Mount Everest when it is the warmest or coldest and why. Have your students circle the warmest three months and draw an "X" through the three coldest months.
    b. Look at the wind speed table. Ask your students if it would be best to climb Mount Everest when it is more or less windy and why. Have your students circle the least windy three months and draw an "X" through the three most windy months.
    c. Look at the **humidity** graph. Tell your students that high humidity indicates a high risk of snow and because the summit is mostly dry, climbers look at the humidity at base camp. With humidity above 50%, there is a chance of snow. If humidity is above 80%, there is a very high chance of snow. Ask your students if it would be best to climb Mount Everest when it is snowing the most or snowing the least and why. Have your students circle the driest three months and draw an "X" through the three months with the most snow.
2. Have your students look for the months that do not have an "X" drawn through them. (March, April, May and October) Tell your students that these times are called "**windows**" where the mountain's weather is at its calmest. Remind your students that it takes two months for most climbers to reach the summit of Mount Everest. Ask your students when they would start their expedition to Mount Everest. Tell your students that the best weather for summitting Mount Everest happens from about May 20 to June 6. Most expeditions start around the end of March to maximize the weather "window."

Activity 4: Daily Weather Tracking

Lesson Length: 10 minutes (daily)

Materials:

- *Colored pencils*
- *What's the Weather? Worksheet (one for each student)* *http://www.montana.edu/everest/resources/worksheets/Worksheet_WhatsTheWeather.pdf*
- *Daily newspaper weather page or computer with Internet access*

1. Explain to your students that they will be tracking the weather on Mount Everest throughout the rest of this unit.
2. On the "What's the Weather" Worksheet, have each student write the current month at the top of the page. Have your students locate the current day of the month on the x-axis.
3. Share the day's high temperature for your hometown with your students. (Your local weather report can be taken from a daily newspaper or an online source.) Ask your students to find this temperature on the y-axis and make a dot using an orange colored pencil on the graph where this temperature meets today's date (from the x-axis).
4. Repeat this process for your hometown's low temperature using a purple colored pencil.
5. Share the day's high temperature for Mount Everest with your students. Mount Everest weather reports can be accessed at the Everest Education Expedition updates page at http://www.montana.edu/everest/updates/index.htm. *[Note: Mount Everest is nearly 12 hours ahead of Montana time, so the "current observations" do not show. Your students*

may have to plot Everest's temperature one day ahead of Montana's temperature.] Ask your students to find this temperature on the y-axis and make a dot using a red colored pencil on the graph where this temperature meets today's date (from the x-axis).

6. Repeat this process for Mount Everest's low temperature using a blue colored pencil.
7. As your students record weather data daily (or at the end of the month), have your students connect the same colored dots from each day to create four line graphs showing high and low temperature changes for Mount Everest and your hometown.
8. At the end of the month, analyze the temperature graph and record the month's highest and lowest temperatures for both Mount Everest and your hometown. Have your students calculate the temperature range (difference between the highest high and lowest low). Ask your students which location experienced a greater range in temperatures that month and why.
9. *Optional: Make a large weather chart similar to the student worksheet. Designate a 'student meteorologist' to record the weather report each day on this class weather chart displayed in your room.*
10. *Optional: To follow the weather on Granite Peak, Montana for comparison, visit* http://www.mountain-forecast.com/peaks/Granite-Peak/forecasts/3901. *This can be tied to the "Mount Everest and Me" worksheet.*

Tying it All Together:

Use the following ongoing activities to check for student understanding of each lesson's concepts. Grade for completion, management of data collection, effort and participation throughout unit.

1. **"Mount Everest and Me" Worksheet**
   http://www.montana.edu/everest/resources/worksheets/Worksheet_EverestandMe.pdf

   This worksheet will be an ongoing activity for your students. In a table format, the "Mount Everest and Me" Worksheet compares Mount Everest, Granite Peak (the highest peak in Montana or you can use another location near to you), and your hometown. Using comparisons, the worksheet reinforces the lesson's content while helping students put this knowledge into perspective by comparing their home state and hometown. Have your students fill in the correlating rows of the table after completing each lesson. This can be completed as a class or individually.
2. **Everest Education Expedition Vocabulary Crossword Puzzle**
   http://www.montana.edu/everest/resources/worksheets/Worksheet_Lesson4Crossword.pdf

   This crossword puzzle reinforces vocabulary presented in each lesson. Have your students fill in the correlating vocabulary words for each lesson's puzzle after each lesson.

Taking it Further:

Monsoons with National Geographic

Explore the monsoons of Southeast Asia in greater depth with a lesson by National Geographic. *http://images.nationalgeographic.com/wpf/media-content/file/wildest-edu-monsoons-cb1278528827.pdf*

Mount Everest Weather Forecasts

Explore weather forecasts for Mount Everest at different elevations with your students. Discuss why the weather changes with elevation and decide whether or not it would be a good day to try to summit the mountain.
http://www.mountain-forecast.com/peaks/Mount-Everest/forecasts/5000