Watching Weather

Unit: Henry as Scientist
Topic: Weather, observation, writing

Thoreau Quotation

"In keeping a journal of one's walks and thoughts it seems to be worth the while to record those phenomena which are most interesting to us at the time, such as the weather."

—*Journal*, January 25, 1860

Background

Henry David Thoreau kept field notes from his daily walks in and around Concord, Massachusetts, which he then used to form the thoughts and observations contained in his journal, which is over 2 million words in total! One of the most common topics on which Thoreau comments in his journal is the weather. He notes such conditions as temperature, wind, precipitation, cloud presence and formation, and humidity. Many days, he writes about how the weather changes throughout the course of that day. He writes about how the weather impacts plants, animals and people. Over the years, he got to know the weather patterns of his area extremely well, so he would often comment on whether a certain weather condition was common or uncommon for that time of year.

Objectives

1. To intentionally observe weather over a specific course of time.
2. To write a thoughtful summary of observations.
3. To learn about multiple weather phenomena after close observation.

Method

Students will be asked to find a place outdoors that they will regularly visit at regular intervals designated by the instructor. They will be asked to observe the weather each time they visit that spot and document their observations, with both writing and drawing, in their field notebooks.

Time Required

Depends on the structure chosen

Materials

- Field notebooks, pencils
- Thermometer (or other instrument that provides current temperature)
- Cloud poster (see Additional Resources)

Procedure

1. Students are instructed to identify a place outdoors that they will visit at regular intervals over a specified period of time. In this location, they will observe the weather. Alternatively, a teacher can find a spot on school grounds that will be used and take the class there for each regular observation.
2. Instructor decides what timeframe he/she wants this lesson to cover. Students can be asked to visit their designated spaces once a day for a certain period of time, once each morning and once each night for a certain period of time, or once a week for a longer period of time such as a few months. Use intervals that work best for your instructional goals and that work in your climate.
3. Once in their spots, students should record such observations/information as:
    a. Temperature
    b. Wind (speed, direction)
    c. Sun/Cloud presence/appearance
    d. Precipitation
    e. Humidity

    Even if they don't have precise measurements for these factors (e.g., they don't know the exact speed of the wind), have them describe it in their own words and draw pictures of the clouds they see. Encourage them to use relative or descriptive terms, such as strong, light, still, bright, sticky, etc., to describe conditions for which they don't have exact measurements.
4. Once they are back inside, have them record the weather for the area (weatherunderground.com is a good site to check) to see how closely their observations match with measured data. Also, have them check the cloud poster to identify the types of clouds they saw that day.
5. At the end of the observation time period, have each student plot their estimated temperature or precipitation over time compared to the measured temperature or precipitation.

Reflect and Explain

- If you went to your spot at the same time each day, do you think this impacted your observations? How would it have been different if you would have visited your spot at a different time each day?
- Compare and contrast the different observations you made. How did the weather change over the course of time? Was it similar or very different? How did your daily observations compare to the measured data? Did your estimates become closer or further away from the measured data?

- Did you start to observe any patterns in your local weather that you had not noticed before? Do the clouds seem to travel in a certain direction most often? Are there any connections to humidity and other weather factors?

Extensions

1. As Thoreau collected natural specimens during his walks and put them in his hat in order to study them upon his return home, you can have the students collect specimens from at or near their spots. Ask them to collect a natural specimen that demonstrates some characteristic of the weather during each visit (e.g., a piece of dry dirt on a hot, sunny day; a piece of wet dirt/mud on a rainy day; a wet twig on a rainy day; a piece of grass with dew on a cool morning, etc.). Ask them to draw a picture of that object in their journal and write about how the weather has affected that object.
2. Take a field trip to a local TV station or invite a local meteorologist to come speak to the class and learn how weather is predicted. How might weather predictions have been different during Henry's time? Why is weather important today? Why was it important during Henry's time?
3. Have students build a weather station and do their own daily readings after completing the observations rather than relying on the internet or other sources for the measured data.

Vocabulary

cirro-form clouds - The Latin word 'cirro' means curl of hair. Composed of ice crystals, cirro-form clouds are whitish and hair-like. There are the high, wispy clouds to first appear in advance of a low pressure area such as a mid-latitude storm system or a tropical system such as a hurricane.

climate - the average course or condition of the weather at a place usually over a period of years as exhibited by temperature, wind velocity, and precipitation.

cumulo-form clouds - Generally detached clouds, they look like white fluffy cotton balls. They show vertical motion or thermal uplift of air taking place in the atmosphere. They are usually dense in appearance with sharp outlines. The base of cumulus clouds are generally flat and occurs at the altitude where the moisture in rising air condenses.

dew point - the temperature at which the moisture in the air forms visible drops of water; the temperature at which dew forms.

fog - vapor condensed to fine particles of water suspended in the lower atmosphere that differs from cloud only in being near the ground.

humidity - Generally, a measure of the water vapor content of the air. Popularly, it is used synonymously with relative humidity.

nimbo-form clouds - a special rainy cloud category which combined the three forms Cumulo + Cirro + Stratus. He called this cloud, 'Nimbus', the Latin word for rain. The vast majority of precipitation occurs from nimbo-form clouds and therefore these clouds have the greatest vertical height.

precipitation - The process where water vapor condenses in the atmosphere to form water droplets that fall to the Earth as rain, sleet, snow, hail, etc.

strato-form clouds - From the Latin word for 'layer' these clouds are usually broad and fairly wide spread appearing like a blanket. They result from non-convective rising air and tend to occur along and to the north of warm fronts. The edges of strato-form clouds are diffuse.

For 10 different types of cloud definitions visit
http://www.srh.noaa.gov/jetstream/clouds/basicten.html

Common Core Standards

English Language Anchor Standards (all grades)

- CCSS.ELA-LITERACY.CCRA.W.2
  Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
- CCSS.ELA-LITERACY.CCRA.W.7
  Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
- CCSS.ELA-LITERACY.CCRA.W.8
  Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
- CCSS.ELA-LITERACY.CCRA.W.10
  Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.
- CCSS.ELA-LITERACY.CCRA.L.1
  Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
- CCSS.ELA-LITERACY.CCRA.L.4
  Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.
- CCSS.ELA-LITERACY.CCRA.L.6
  Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and

career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

Math Practice Standards (all grades)

- CCSS.MATH.PRACTICE.MP5 Use appropriate tools strategically.
- CCSS.MATH.PRACTICE.MP6 Attend to precision.

Grade 3 Content Standards

- CCSS.MATH.CONTENT.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 scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets.

Grade 4 Content Standards

- CCSS.MATH.CONTENT.4.MD.B.4
  Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.

Grade 5 Content Standards

- CCSS.MATH.CONTENT.5.MD.B.2
  Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.

Additional Resources

- Information on clouds from NOAA
  http://www.srh.noaa.gov/jetstream/clouds/clouds_intro.html
- Cloud posters
  - http://spaceplace.nasa.gov/posters/en/
  - http://www.srh.noaa.gov/jetstream/clouds/cloudchart.html#myModalm5
  - http://science-edu.larc.nasa.gov/cloud_chart/