CITIZEN SCIENTIST

Temperatures

These grab and go lessons aim to bring the STEM skills of inquiry, critical thinking, problem solving, & resiliency to life through hands-on learning.

Grade Level
All

Lesson Length
Varies

STEM Careers
- Climatologist
- Meteorologist
- Atmospheric Scientist

Life Skills
- Keeping Records
- Planning/Organizing
- Critical Thinking
- Contributions to Group Effort
- Cooperation

Related Activities
- More citizen scientist efforts: *https://science.nasa.gov/citizenscientists*

  http://citizenscience.org/

Learn More
- Visit Raising Nebraska *raisingnebraska.unl.edu*
- Visit Hastings Museum *hastingsmuseum.org*

LEARNING OBJECTIVES

By the end of the lesson, students should be able to:
- Record temperature measurements
- Share recorded measurements

EDUCATIONAL STANDARDS SUPPORTED

- NE 2010 2.1.1.d Describe objects, organisms, or events using pictures, words, and numbers
- NE 2010 2.1.1.e Collect and record observations
- NE 2010 5.1.1.d Make relevant observations and measurements
- NE 2010 5.1.1.e Collect and organize data
- NE 2010 5.1.1.g Share information, procedures, and results with peers and/or adults
- NE 2010 8.1.1.e Make qualitative and quantitative observations
- NE 2010 8.1.1.f Record and represent data appropriately and review for quality, accuracy, and relevancy
- NE 2010 8.1.1.h Share information, procedures, results, and conclusions with appropriate audiences
- NE 2010 12.1.1.e Use tools and technology to make detailed qualitative and quantitative observations
- NE 2010 12.1.1.f Represent and review collected data in a systematic, accurate, and objective manner
- NE 2010 12.1.1.j Share information, procedures, results, conclusions, and defend findings to a scientific community (peers, science fair audience, policy makers)

MATERIALS LIST

- Thermometer
- Pencil/Pen
- Sun vs Shade Worksheet
- Eclipse Citizen Scientist Worksheet
- Graph Paper (or Computer)
- Markers/Crayons

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PREPARATION

- Print Sun vs Shade Worksheet
- Print Eclipse Citizen Scientist Worksheet
- Determine your times for the Solar Eclipse

DO

INTRODUCTION

The solar eclipse gives students a unique opportunity to serve as scientists as a part of a **Citizen Scientist** effort. There is strong evidence from past solar eclipses, that there will be a temperature change from the beginning stage, to total eclipse, to completed stage. According to NASA, the difference in temperature during a solar eclipse is ¾ or ½ maximum day-night difference. You can calculate the day-night difference by taking the typical daytime minus nighttime temperature difference at the time of year and location on the Earth. For instance, in Hastings, Nebraska the average high is 85 °F and the low is 62 °F. The maximum day-night difference is 23 °F. Therefore, Hastings, NE could experience a change of 10 or 11 degrees.

As a part of the Citizen Scientist effort, students will record temperatures and share to a larger system.

To determine your amount of totality and time for your location, visit: https://eclipse2017.nasa.gov/sites/default/files/interactive_map/index.html This is an interactive map of the United States that you can pin point your location. Depending on the age of your students, you may have them explore this link and assist in determining their time frame for the estimated time for taking measurements. Please note: the time is listed in Universal Time (UT), therefore please adjust your time. For those in Central Standard Time (CST), minus 6 hours from the listed UT time.

For specific Solar Eclipse information, please review the Solar Eclipse reference materials provided in this packet.

Vocabulary
Citizen Scientist: a person who serves as a scientist and reports back to a larger effort.

Suggestion
If you have morning and afternoon groups, you could share the data with classes. If not, we recommend going out in the morning and again in the afternoon.

Age Adjustment
For older youth, encourage plotting via Excel and create a graph using a computer program.

OPENING QUESTIONS

- What is happening on August 21, 2017?
- What is a solar eclipse?
- What do you think will change due to the sun being blocked?

ACTIVITY 1: SUN VS. SHADE

Today we are going to explore the impact of the sun in regards to temperature. What measuring device can we use to observe and record the temperature? Right, a thermometer.

(Review with your students how to read the thermometers that you will be using based on what is available to your school/organization.)

We are going to go outside and record the time, location (sun or shade), and the temperature. Divide into two groups. One group will take measurements in the shade and the other group will record measurements in the sun. Record temperature measurements, in either half hour or hour increments, between 9 am and 2 pm. (adjust time range based on your class needs).

Post recording:
Graph the time of day with the temperature. Plot the shade temperatures using one line/color and the sun temperatures using a different line/color.

Students can share in group presentations or through group discussions, encourage review such as:

- What do you notice about your graphs?
- Which location had a higher temperature?
- Why do you think that?
- If we did this during a different part of the day, what would you expect to see?

Think about the solar eclipse happening on August 21, 2017 – What do you think will happen to the temperature on that day? Record your hypothesis on the "Eclipse Citizen Scientist" sheet.

ACTIVITY 2: ECLIPSE DAY! CITIZEN SCIENTIST

Today you are going to be a citizen scientist! Please pull out your "Eclipse Citizen Scientist" sheet. Let's refresh what our temperatures did on the non-solar eclipse day.

As a part of observing the solar eclipse, we are going to record temperatures throughout the day and during the eclipse. We will record on paper and then report onto a data system.

If you have not done so yet, please write down your hypothesis for what the temperatures will do during the Solar Eclipse.

Timing
Complete Activity 2 on August 21, 2017 during the Solar Eclipse.

Complete the Eclipse Citizen Scientist sheet. Recommended measurements include:

- Temperature Base Measurements – Start & End of Partial Eclipse
- Starting at 30 minutes prior to Total Eclipse Time, measure every 5 minutes to Total Eclipse and till 30 minutes post Eclipse.

You may record your results on a public site at: http://raisingnebraska.unl.edu

Did you prove your hypothesis true? Justify why you believe you proved or did not prove your hypothesis to be true.

REFLECT

What did you do today?

Did you prove your hypothesis true? And what is your reasoning for the statement?

Did you enjoy recording temperatures?

Did you like being a citizen scientist?

What was your favorite part of today?

APPLY

What other events or times would recording temperatures be important?

What other events or items need temperatures measured?

When else could you be a citizen scientist?

What career(s) would use similar skills that you used today?

We want to hear from you!

Let us know what you thought of the lesson or send us a picture of youth participating in the lesson.

#NE4HSTEM #ECLIPSE2017

References

https://eclipse2017.nasa.gov/temperature-change-during-totality

http://usclimatedata.com/climate/hastings/nebraska/united-states/usne0226

https://sunearthday.nasa.gov/2006/faq.php

https://eclipse2017.nasa.gov/sites/default/files/interactive_map/index.html

https://eclipse.gsfc.nasa.gov/SEhelp/TimeZone.html

SUN VS. SHADE RECORD SHEET

Sun vs. Shade

NAME

DATE

Directions:
Complete the table below by recording time of day and temperature.

Time (hr/min)	Location (sun vs. shade)	Teperature (degrees)	Overall Observation

Extension is a Division of the Institute of Agriculture and Natural Resources at the University of Nebraska-Lincoln cooperating with the Counties and the United States Department of Agriculture.
The 4-H Youth Development program abides with the nondiscrimination policies of the University of Nebraska-Lincoln and the United States Department of Agriculture.

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ECLIPSE CITIZEN SCIENTIST RECORD SHEET

Sun vs. Shade

NAME

DATE

My hypothesis for what will happen to the temperature during the solar eclipse is:

The total eclipse time is to happen at:

Eclipse Status	TIme of Day (example: 11:35 am)	Teperature (degrees)	Overall Observation
Baseline Temp (Start of Partial)			
30 minutes prior			
25 minutes prior			
20 minutes prior			
15 minutes prior			
10 minutes prior			
5 minute prior			
Total Eclipse			
5 minutes post			
10 minutes post			
15 minute post			
20 minutes post			
25 minutes post			
30 minutes post			
End of Partial			
Baseline Temp (Start of Partial)			

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My hypothesis was proven true? YES or NO

Why?

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