2024 ECLIPSE IN VERMONT

Vermont Public

Northern Vermont will be in the final path of totality for a total solar eclipse on Monday, April 8, 2024. This means Vermonters will experience up to three and a half minutes of complete or partial darkness between 3:20 p.m. and 3:30 p.m.—the only total solar eclipse to travel across Mexico, the United States, and Canada during the 21st century! Find out if you're in the path of totality, how to view the solar eclipse safely, and access more educational resources at **vermontpublic.org/eclipse.**

FOR WHO? THE MOON, SUN, AND YOU! This learning guide is for families, caregivers, and teachers of students in middle and high school.

HOW

WATCH: ECHO's Science and Stories on Vermont Public broadcast or YouTube. Elizabeth will read and help us learn about *Moon Bear's Shadow* by Frank Asch and *Someone is Eating the Sun* by Ruth Sonneborn.

LISTEN: To the *But Why* Podcast about eclipse events in April

ASK: Be curious! Ask our *But Why* team questions...

THEN join Vermont Public and the Fairbanks Museum for extensive coverage of this epic event, including live total solar eclipse coverage from *But Why* host and executive producer Jane Lindholm and astronomy expert Mark Breen from the Fairbanks Museum and Planetarium. Find all the ways to follow live coverage at **vermontpublic.org/eclipse.**

WHY

College, Careers, and Civics Life (C3): 6-8: Geographic Representations: Spatial Views of the World: D2.Geo.3.6-8. Use paper-based and electronic mapping and graphing techniques to represent and analyze spatial patterns of different environmental and cultural characteristics.

History: Perspectives
1. D2.His.4.6-8. Analyze multiple factors that influenced the perspectives of people during different historical eras.
2. D2.His.5.6-8. Explain how and why the perspectives of people have changed over time.
3. D2.His.6.6-8. Analyze how people's perspectives influenced what information is available in the historical sources they created

History: Change, Continuity, and Context
1. D2.His.7.9-12. Explain how the perspectives of people in the present shape interpretations of the past.
2. D2.His.8.9-12. Analyze how current interpretations of the past are limited by the extent to which available historical sources represent perspectives of people at the time

Next Generation Science Standards (NGSS): Earth's Place in the Universe
1. MS-ESS1-1: Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
2. MS-ESS1-3: Analyze and interpret data to determine scale properties of objects in the solar system.

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Education Ambassadors

VERMONT AGENCY OF EDUCATION Vermont Public

BUT WHY

FAIRBANKS MUSEUM & planetarium

VERMONT AGENCY OF EDUCATION

Vermont Public has curated **PBS LearningMedia** resources for Vermont educators of all age bands at **vermontpublic.org/educators.** And look for the **But Why: Adventures! Northeast Nature** series, made for monthly classroom use throughout the year.

PREPARE AND PREDICT with Vermont Public

Discover what makes this eclipse possible by understanding the position of the Moon, Sun, and Earth on April 8, 2024. **Let's make a model of the eclipse to show why this phenomenon does not happen every month.**

ASSEMBLY

1. Make models of the Earth and Moon:

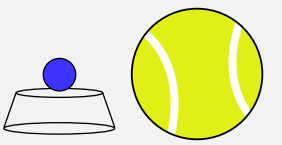
- Make a model of the Earth by rolling out a small ball of green or blue clay (about 0.5 to 0.75 inch in diameter).
- Use a different color to make the Moon – about one-quarter the diameter of your model Earth.
- Use a tennis ball (or one of similar size) to model the Sun.

2. Make a stand to hold your model Earth so that it sits at the same level as the center of the Sun (tennis ball). To do this, cut an inverted cup to the right height. When you're done, set the cup cut-side down and push your clay ball, Earth onto the top so that it sticks. This is the Earth Cup (EC).

Materials:

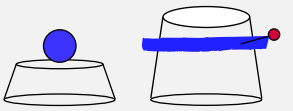
Tennis ball or round shape
Three clear plastic 9-ounce disposable plastic tumblers
Two different colors of polymer clay
Pushpin
Two different colors of permanent marker (red and blue are referenced in the instructions)
Flashlight or other point-source of light

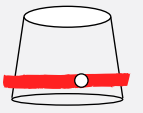
Earth Cup, next to the sun model



3. Invert a cup and place it between the Earth (clay ball) and the Sun (tennis ball). Using the blue marker, draw a circle around this cup that is even and parallel to the tabletop. To make an even circle, hold your pen and spin the cup as it sits flat on the tabletop. Insert the pushpin anywhere on the circle. This is your Ecliptic-Plane cup (EP). The pushpin will be used to tilt the third cup for the exploration.

Earth Cup next to Ecliptic-Plane cup





Tilted-Lunar-Orbit cup

4. Invert your third plastic cup. Then, using the red marker, draw a circumference low down, close to the cup's brim. It should be parallel to the tabletop, about 3/8 inch (1 cm) above the brim. To make an even circle, hold your pen and spin the cup, as you did in Step 3. Gently press the clay moon anywhere on the circle. This is your Tilted-Lunar-Orbit cup (TLO).

5. Stack your cups in the following order: Ecliptic-Plane cup (EP) stacked on the Earth cup and the Tilted Lunar Orbit cup (TLO) on top of the EP with the TLO brim resting on the pushpin of the EP. This should allow the TLO cup to tilt. When all the cups are stacked, you should see that the red circle on the TLO cup crosses the blue circle on the EP cup. Place your sun in the middle of the table next to your model and you're ready to go.

TO DO AND NOTICE

You can simulate the orbit of the Moon around the Earth by holding the pushpin with one hand and rotating the TLO cup counterclockwise with the other. (The Earth does not spin in this model. Inform students that in actuality, the Earth would rotate as well.) To model the Earth-Moon system as it orbits the sun, hold the pushpin, keeping it oriented in the same direction (pointing to the same part of the room the whole time). Move the stack of cups around the model sun to simulate the orbit of the Earth-Moon system around the sun. Do this while rotating the TLO cup counterclockwise. There should be about 12 rotations of the TLO cup for every rotation around the Sun. As you simulate these orbits, look for and count the number of places where the Earth, Moon and Sun line up on the same plane. (The Moon can be in the middle of the alignment or the Earth can be in the middle of the alignment.) When the three celestial bodies come into alignment, that is when an eclipse occurs.

Now it is time to use your flashlight to mimic the light emitted by the Sun. When you find the three bodies in alignment, point the light (as if it is coming from the Sun) at your cups and see if a shadow is broadcast either by the Earth onto the Moon, or by the Moon onto the Earth.

WHAT'S GOING ON?

The geometric lineup of three celestial bodies is called syzygy. Syzygy only happens when the moon (on the red circle of your Tilted-Lunar-Orbit cup) crosses the blue circle of your Ecliptic-Plane cup. That blue circle represents the ecliptic, the flat disk traced out by the Earth as it moves around the sun. All the planets in our solar system orbit the Sun roughly on this same astronomically large, flat, imaginary plane.

Source: Courtesy NASA, Credit: ESA

SPACE FOR NOTES

SAFETY TIP: Remember we all need special eclipse glasses or a viewer (shadow camera) to watch the eclipse event safely.