

SOLAR SCIENCE WITH THE PEANUTS GANG!

Dear Educator,
 On April 8, 2024, a solar eclipse will sweep across the United States. This gives students throughout the country a unique opportunity to learn the science behind a solar eclipse and the safe way to experience its "magic." That's why the Peanuts Gang, in cooperation with NASA and the education specialists at Young Minds Inspired, have developed these free *Solar Science* activities to complement and energize your STEM curriculum. Plus, each activity includes a take-home component inviting families and their children to become citizen scientists by recording what they learn during the eclipse!

Share this program with other grade 3-6 teachers at your school.

Tell us your opinion of the program at ymiclassroom.com/feedback-peanutseclipse.

We look forward to your comments and suggestions.

Sincerely,



Dr. Dominic Kinsley
 Editor in Chief
 Young Minds Inspired

Target Audience

Grades 3-6

Program Components

Available at ymiclassroom.com/peanutseclipse:

- this teacher's guide
- three reproducible activity sheets
- curriculum standards
- downloadable Peanuts solar eclipse comic strips
- an online feedback form

Concepts and Skills

Staying safe while viewing a solar eclipse	Vocabulary development
Exploration of space and the solar system	Reading informational text
Engaging in real-world science experiences	Observation
	Data analysis

How to Use This Program

Download and photocopy the activity sheets for your class and have students complete the take-home activities at the bottom with their families. To launch the program, provide students with copies of the Peanuts solar eclipse comic strips, or display them on your smartboard to read with the class.

Activity 1 What Is an Eclipse?

Ask students to raise their hands if they know what an eclipse is. Have they experienced one? Was it a lunar or solar eclipse? Do they know the

difference? Invite students to share their experiences.

Tell students that a solar eclipse is coming to the United States on April 8, 2024, and that it will be a total eclipse in many parts of the country. There won't be another total solar eclipse in the U.S. until 2044. So now's the time to find out what causes an eclipse and why there are different types of eclipses.

Pass out the activity sheet and review the directions. Have students work individually or in small groups to complete the activity.

Answers: 1. Total solar eclipse – D; 2. Annular solar eclipse – E; 3. Partial solar eclipse – A; 4. Total lunar eclipse – C; 5. Partial lunar eclipse – B.

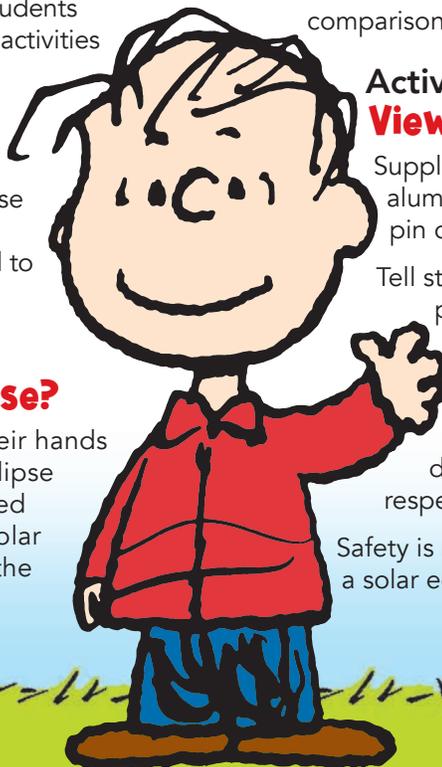
Extension: Ask students if they can guess why the Moon can cover the Sun in a total eclipse (similar to the effect of holding up their thumb to cover something on the wall across the room from them). Even though more than 64 million moons can fit inside the Sun, the Sun is so far away that from our point of view, it appears that the Moon can cover it up. See <https://science.nasa.gov/learning-resources/how-big-is-the-solar-system/> for comparisons between planetary bodies.

Activity 2 Viewing an Eclipse Safely

Supplies needed: white cardstock, aluminum foil, tape, scissors, and a pin or paperclip

Tell students that, throughout history, people have responded to eclipses with fear, confusion, or amazement. Some Native Americans and other Indigenous people stay inside during a solar eclipse out of respect and to stay safe.

Safety is important for everyone during a solar eclipse. It is never safe to look



Questions? Contact YMI toll-free at 1-800-859-8005 or by email at feedback@ymiclassroom.com.

directly at the Sun during a solar eclipse (except during the few moments when the Sun is totally covered by the Moon — see below). There are a variety of ways to safely observe a solar eclipse, including special solar viewing glasses and a safety tool called a pinhole projector.

Pass out the activity sheet and review the directions. Have students work individually or in small groups to complete the activity. For reference, see <https://www.jpl.nasa.gov/edu/learn/project/how-to-make-a-pinhole-camera>. Answers to Part 1 will vary.

Note: If your students will be in the path of totality on April 8, 2024 (see <https://www.timeanddate.com/eclipse/solar/2024-april-8> to find out), they can safely look at the Sun during the few moments when it is completely covered by the Moon. They should have an adult help them know when they can do this. See <https://eclipse.aas.org/eye-safety> for guidelines when using protective glasses or a pinhole projector. Students will see the Sun's bright corona encircling the dark Moon, but they must look away as soon as the Moon starts to move past the Sun.

Extension: Ask students to spread the word about eclipse safety by creating public service messages as a poster, comic strip, slideshow, video, or meme that can be shared with family and friends.

Activity 3 Be a Citizen Scientist

NASA wants people — even students — to help them study science. NASA calls these people “citizen scientists,” and over the years they have helped NASA make thousands of important scientific discoveries! (See **science.nasa.gov/citizen-science** to learn more.)

There are also apps that you or another adult can download. For the April 8 solar eclipse, NASA is asking citizen scientists to use the free GLOBE Observer Eclipse app (downloadable at <https://observer.globe.gov/do-globe-observer/eclipse>) and a thermometer to record atmospheric effects of the eclipse. Students can also make cloud observations or take pictures of the land cover. You can also use the SunSketcher app (<https://sunsketcher.org>) to prop up your phone to take pictures of the Sun during the eclipse.

Pass out the activity sheet and tell students that they are going to become citizen scientists too! Review the introduction together, then have students complete Parts 1 and 2.

Answers: Part 1: a. time of day (height of the Sun), latitude, cloud cover, cloud type, ground cover; b. observers in the path of totality experience a greater change in temperature than observers outside the path. Part 2: Answers will vary.

If school is in session during the eclipse, have students complete the first two days of observations at school, and then take them outside during the eclipse to complete the final observations, following all safety protocols. After the eclipse, return to the classroom and compare and analyze the data. As a class, you might also read and discuss select eclipse stories at <https://science.nasa.gov/eclipses/stories> to learn what others experienced.

Extension: Imagine living on Earth thousands of years ago when one day the sky suddenly got dark and the Sun became black. How would you explain what was happening? In earlier times, people often created stories to describe natural phenomena, like volcano eruptions or lightning, which then became legends. Have students work together to create stories about how people in earlier times might have described the sky going dark in the middle of the day when the Moon covered the Sun.

Resources

Eclipse Safety: science.nasa.gov/eclipses/safety/

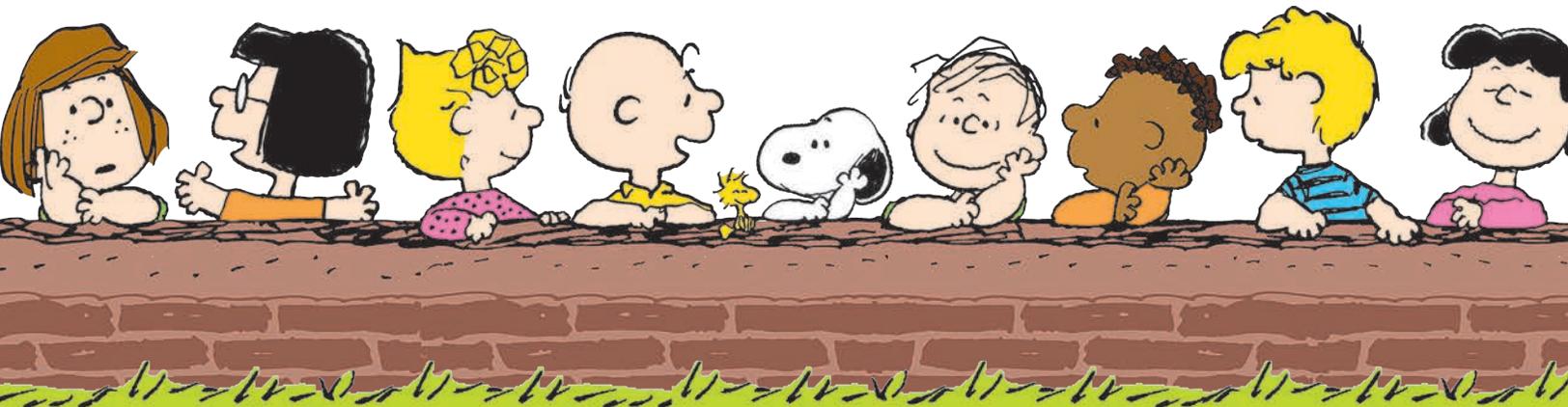
Eclipse Overview: science.nasa.gov/eclipses/faq/

Sun's Corona: myasadata.larc.nasa.gov/mini-lessonactivity/what-sun-corona

Solar Eclipse Map: science.nasa.gov/resource/nasas-2023-and-2024-solar-eclipse-map/

Heliophysics Education Framework: science.nasa.gov/learn/heat/big-ideas/

YMI site: ymiclassroom.com/peanutseclipse



WHAT IS AN ECLIPSE?

On April 8, 2024, the United States will experience a solar eclipse. How much of the Sun will be blocked out depends on your location. Visit www.timeanddate.com/eclipse/solar/2024-april-8 and type in your town name to find out what to expect where you live.

There are different types of eclipses. Visit the links at right to learn more. Then match the eclipse to its definition by writing the correct letter in the box next to the name of each type of eclipse. Use the images to help you.

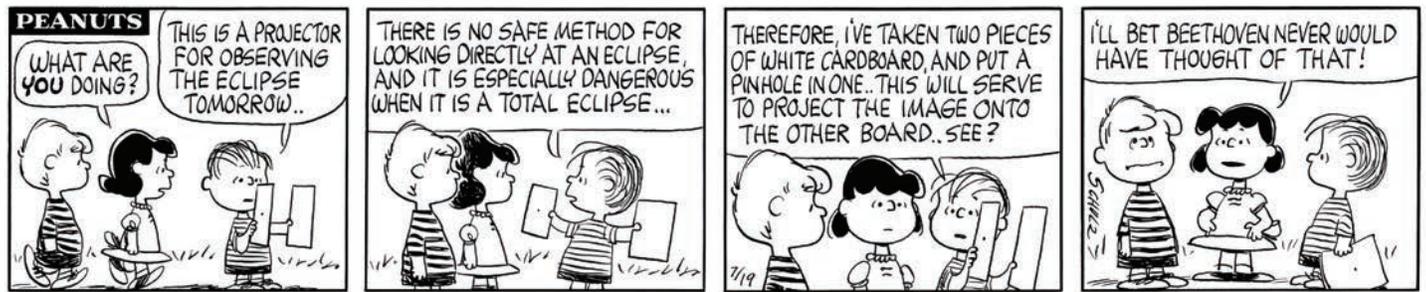
Resources:

- NASA: Phases, Eclipses and Supermoons
<https://moon.nasa.gov/moon-in-motion/phases-eclipses-supermoons/eclipses>
- NASA: Types of Solar Eclipses
<https://science.nasa.gov/eclipses/types/>
- NASA Space Place: Lunar Eclipses and Solar Eclipses
<https://spaceplace.nasa.gov/eclipses/en/>

Type of Eclipse		Definition
1. Total solar eclipse <input type="checkbox"/>		A. The Moon is between the Sun and Earth, casting a shadow on Earth, but the observer is located in the penumbra shadow, which only blocks part of the Sun.
2. Annular solar eclipse <input type="checkbox"/>		B. Earth is between the Moon and the Sun, but only a part of the Moon passes through Earth's shadow.
3. Partial solar eclipse <input type="checkbox"/>		C. Earth is between the Moon and the Sun, and the entire Moon passes through Earth's shadow, turning red because the sunlight reaching it must pass through Earth's atmosphere.
4. Total lunar eclipse <input type="checkbox"/>		D. The Moon is between the Sun and Earth, casting a shadow on Earth, and the observer is located in the umbra shadow, which completely blocks the Sun, causing the sky to get darker.
5. Partial lunar eclipse <input type="checkbox"/>		E. The Moon is between the Sun and Earth, casting a shadow on Earth, but because the Moon is far from Earth in its elliptical orbit, appearing smaller, it covers only the middle of the sun, leaving a bright "ring of fire" around the Moon's shadow.

FAMILIES! Visit <https://science.nasa.gov/eclipses/future-eclipses/eclipse-2024/> to get ready for the solar eclipse on April 8, 2024. It will be twenty years before another solar eclipse crosses North America. How old will your children be then? Consider writing about the April 8 eclipse as a keepsake to look back on during the next eclipse. Add pictures of your children enjoying the eclipse safely!

VIEWING AN ECLIPSE SAFELY



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Part 1: Now that you know the science behind eclipses, learn how to prepare for viewing the solar eclipse safely on April 8, 2024. Read the articles at each link, then answer the questions.

Safety First: <https://science.nasa.gov/eclipses/safety/>

Looking directly at the Sun at any time can cause permanent eye damage. What are some ways you can view an eclipse safely?

The Corona: <https://spaceplace.nasa.gov/sun-corona/en/>

The Sun's corona, or outermost layer, is not easily seen. But during the moment of totality in a solar eclipse, when the Moon completely covers the Sun, the corona bursts into view. This gives scientists a chance to study it. What are some things scientists have learned about the corona?

Part 2: In the comic strip above, Linus warns that looking directly at the Sun, even when it is partially eclipsed, can cause eye damage. You can watch a solar eclipse with help from an adult if you use a pinhole projector, like the one Linus is making. Follow your teacher's directions to make your own pinhole projector. Be sure to stand with the Sun behind you when using the projector.

For this, you will need two pieces of white cardstock, aluminum foil, tape, scissors, and a pin or paperclip.

1. Cut out a 2-inch-square hole in the middle of one of the pieces of cardstock.
2. Tape a small piece of aluminum foil over the hole.
3. Flip the cardstock over and poke a pinhole in the middle of the foil.
4. To test your projector, place the second piece of cardstock on the ground. Stand with the Sun behind you (important!) and hold the cardstock with the pinhole above the one on the ground so that it blocks the Sun except for sunlight that goes through the pinhole. Move the pinhole nearer or farther from the cardstock on the ground until you see an image of the Sun projected on it.

FAMILIES! On April 8, 2024, a solar eclipse will sweep across the United States, presenting a stunning experience to millions. Visit www.timeanddate.com/eclipse/solar/2024-april-8 to see when the solar eclipse will occur where you live and make plans to watch it safely with your children using the pinhole projector your child made in class or eclipse safety glasses, or by watching it online indoors. See <https://science.nasa.gov/eclipses/safety> for safety tips.



BE A CITIZEN SCIENTIST



(Note: The comic above was first published in a year when the eclipse was on a Saturday. The 2024 eclipse is on a Monday.)

On April 8, 2024, the United States will experience a solar eclipse. A total solar eclipse will only be seen in certain areas, while others in the U.S. will see a partial eclipse.

NASA conducts many experiments during a solar eclipse to learn more about the Sun and how it affects Earth. You can be a scientist, too — a citizen scientist! With your teacher or an adult, follow the steps below to gather data at school or in your neighborhood for two days before the eclipse and on the day of the eclipse. Record your data in the table.

Part 1: Watch the visualization of the temperature data collected during a 2017 solar eclipse at <https://www.youtube.com/watch?v=yiNF1PEV5f8>. (Learn more here: <https://observer.globe.gov/hidden/science-connections/eclipse2017>.)

- What variables would affect the temperature data, aside from the shadow of the Moon?

- How are the temperature changes during the solar eclipse experienced differently by people in the path of totality and those outside the path?

Part 2: Gather and record data. Go to <https://www.timeanddate.com/eclipse/solar/2024-april-8> to determine the time of day and type of solar eclipse that will occur at your location.

Time: _____ Type of eclipse expected (partial or total): _____

Part 3: Use the chart below to make observations at the approximate time of the solar eclipse during the two days before the eclipse and on the day of the eclipse.

	Location (school or home)	Time (near the time of the eclipse)	Time of maximum eclipse	Temperature	Cloud description
Day 1					
Day 2					
Eclipse Day Monday, April 8, 2024					

Part 4: Analyze your data after the eclipse. *What was different during the eclipse? Why do you think those differences happened?* Write about it on the back of this sheet.

FAMILIES! Want to get a head start on viewing the next solar eclipse? Check out <https://www.timeanddate.com/eclipse/list-annular-solar.html> to learn when the next annular solar eclipses will occur worldwide over the next 10 years.

