

# The Solar Eclipse of 2017: Teacher Toolkit

By: Rachel Connolly, Director of STEM Education, WGBH and PBS LearningMedia

Are you a K-12 teacher looking for ideas and information about what to do with your students, your school, or your community around the upcoming solar eclipse on August 21, 2017? WGBH has gathered information from trusted content partners into this Teacher Toolkit and [accompanying folder of resources on PBS LearningMedia](#).



**A Recording of our Teacher PD Webinar (4/19/17) can be viewed (and shared) anytime at <http://bit.ly/TeachEclipseWebRec>**

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## The Eclipse Opportunity

An eclipse is a rare phenomenon, offering educators a teachable moment like few others for them and their students. I know firsthand, as a lunar eclipse in 1996 remains a high-point—literally—of my teaching career (more on that [below](#)).

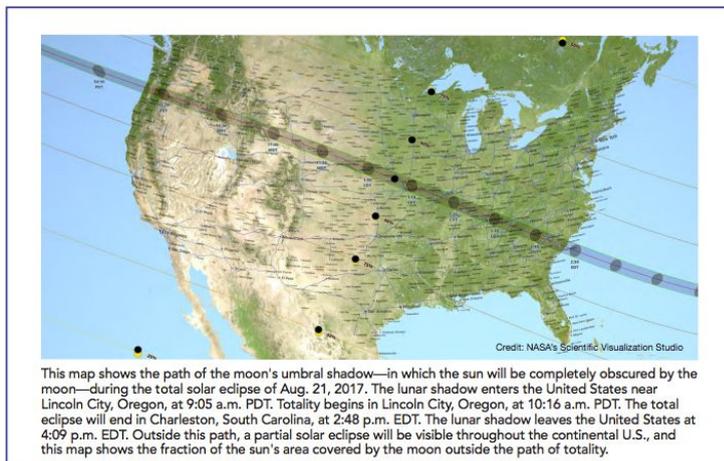
WGBH Education wants to support teachers who are interested in understanding the opportunities—both experiential and instructional—that surround the Solar Eclipse on August 21, 2017. We started by asking teachers what they wanted to know and do about the eclipse. Based on [what teachers told us](#), we [talked with scientists](#) and eclipse experts and put together this “teacher toolkit,” as well as an accompanying [folder of free resources on PBS LearningMedia](#).

If you are a teacher and do not find what you are looking for in the information below, please tweet your question using

#TeachEclipse2017, or post it on our [Facebook page](#). Based on the feedback and the questions that we receive, we will **continue to add resources and information** to this toolkit.

## What is happening where I am?

The first question everyone asks is, “What will the eclipse look like from where I live?” There is an [interactive eclipse map](#) that allows you to click your location and see the calculated eclipse times and duration of annularity for that location. There are also national and state-specific [eclipse maps](#) that you can explore in-depth, as well as a [short video](#) that shows the path of the eclipse across the US. These can help you determine what type of eclipse experience you have to look forward to: partial, total, or possibly none at all. Even though everyone in the contiguous United States (plus parts of South America, Africa, and Europe) will see **at least** a partial solar eclipse, you might consider traveling to the “[path of totality](#)” for an [eclipse event](#) ([even the animals think it is worth it!](#)).



[\[Image source\]](#)

## What if my school is not in session on Aug 21?

If your school is not in session on Aug 21, there are still opportunities that you might want to consider. For example:

- **Before you head out for summer vacation...** You can alert students and their families about the eclipse and what to expect by sending them an [Eclipse Fact Sheet](#) (also [available in Spanish](#)), one of many [free printables](#) available on the NASA Eclipse Website.
- **Host an Eclipse Party!** You can partner with colleagues and use the [Eclipse Party Toolkit](#) to host a “Back-to-School Eclipse Party” for the community on a school playground or field.
- **Join a Library event near you:** Many libraries across the country are hosting eclipse events and looking for volunteers and partners to work with, such as schools. This site includes a [great eclipse guide for libraries](#) that teachers would find quite useful for planning community events, including for their school.
- **Field Trip!** Members of the school community might be interested in traveling to an eclipse event. Check out [this map of events](#) to find one near you. If you do head to an event, be sure to [be prepared](#) to safely enjoy your eclipse experience.

## Science Instruction and a Solar Eclipse

For those who will be in school by Aug 21, the eclipse is a chance to kick-off a learning experience about the Earth-Sun-Moon system or the Sun and its energy. K-12 educators can find resources in the form of activities and lessons in the [PBS LearningMedia eclipse folder](#), and on the [K-12 Formal Education page](#) of the NASA Eclipse site.

## Resources of note

- [The Universe in the Classroom: Getting Ready for the All American Eclipse!](#) An NGSS Storyline Approach to Classroom Instruction by Brian Kruse
- [An Observer's Guide to Viewing the Eclipse](#), by Andrew Fraknoi and Dennis Schatz
- **Modeling the Eclipse** is a great activity to frame and explain the eclipse phenomenon:
  - [NSTA's Science Scope: Exploring Lunar and Solar Eclipses via a 3-D Modeling Design Task](#) (Middle School level)
  - [NSTA's The Science Teacher: Modeling the Eclipse](#) (High School level)
  - [Modeling Meaningful Eclipses](#), an activity from NASA's [Night Sky Network Eclipse Resources](#)
- The [American Astronomical Society \(AAS\) Educational Materials page](#) includes a section of “**Eclipse Education PDFs**” that offer links to a series of useful articles specifically for Elementary, Middle and High School teachers that have been made available for free from NSTA.
- **Math teachers**, there are a total of 15 [Math Challenges](#) that will take you through some of the basic mathematics related to the eclipse. The mathematics levels span all grades and abilities from elementary proportions and algebra—all the way up to trigonometry and calculus. Share with your math colleagues!
- Many **National Science Teachers Association** articles from Science Scope, Science & Children and The Science Teacher are available on [NASA's K-12 Formal Education page](#).

## Resources in Spanish

- [Eclipse Across America Fact Sheet in Spanish](#) (double-sided, includes sample activities).
- NASA's Space Place offers an [eclipse site for kids in Spanish](#).
- The Exploratorium offers a [video](#) and an [Android app](#) that offers a Spanish language narration option.
- "[Como Ver el Eclipse Solar del 2017 con Seguridad \(How to View the 2017 Solar Eclipse Safely\)](#)" is a 1-page flyer in Spanish that is intended for the general public written by members of the [AAS Solar Eclipse Task Force](#).
- NASA's [Eclipse Glossary](#) includes definitions in Spanish.
- NISE Net offers a [Solar Eclipse Activity](#) with guides and files available in Spanish.
- Sky & Telescope offers this [article and videos](#) (note: external site contains advertisements)

## A Solar Eclipse and the NGSS

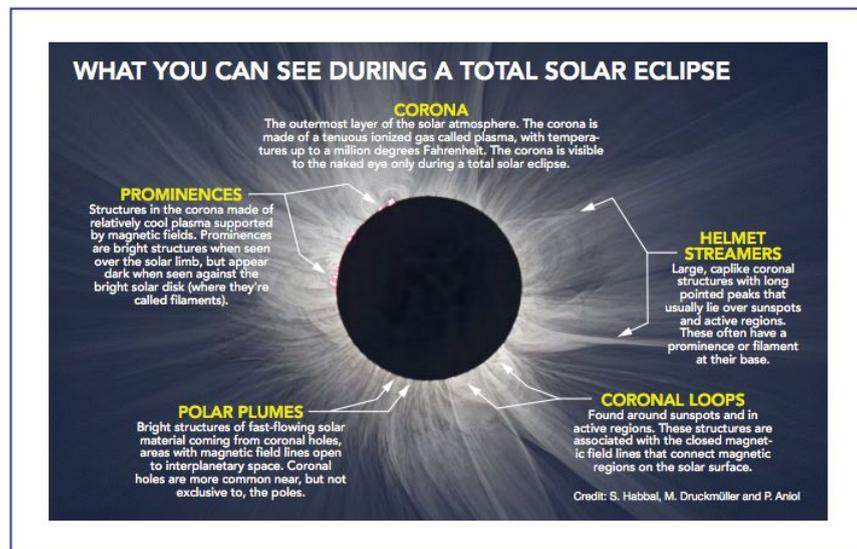
Here are some ideas and connections for the phenomena of a solar eclipse and select NGSS Performance Expectations:

- **K-PS3-1:** Make observations to determine the effect of sunlight on Earth's surface
  - The cooling that happens as the Sun is covered by the Moon is dramatic, and because it comes and goes within minutes, it is a chance to experience how much the "Sun warms the Earth".
- **K-PS3-2:** Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.
  - While you are out there waiting for the eclipse to happen, you could be designing and building "shade" and making shadows!
- **1-PS4-2:** Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated.
  - The Sun makes a great light source for a pinhole camera projector (see image below).
- **1-ESS1-1:** Use observations of the sun, moon, and stars to describe patterns that can be predicted.
- **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.
- **HS-ESS1-1:** Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.

## Experience the eclipse safely with your students

Above all, [safety is key](#) for an enjoyable eclipse experience:

- The Exploratorium offers a [collection of videos on safe eclipse viewing](#) that includes many tips and tools that are accessible for teachers and can make the eclipse viewable by groups of students.
- The NASA's Eclipse [FAQ site](#) offers some great safety and science information, including this for teachers interested in getting **eclipse viewing glasses** for their students:
  - "To date three manufacturers have certified that their eclipse glasses and hand-held solar viewers meet the ISO 12312-2 international standard for such products: Rainbow Symphony, American Paper Optics, and Thousand Oaks Optical. These companies may be found online and the glasses ordered, but you really need to order your glasses many months in advance because of the anticipated huge audience that could number in the hundreds of millions."
- Want to enable groups of students to observe the eclipse at the same time? "[Build a Sun Funnel for Group Viewing of the Great American Solar Eclipse of August 21, 2017](#)" is a step-by-step illustrated guide to constructing a simple, inexpensive device that **enables multiple people to observe a projected image of the Sun simultaneously and safely**. Written by Rick Fienberg, Chuck Bueter, and Lou Mayo, the document is intended for knowledgeable amateur and professional astronomers who know how to operate a telescope for solar observing.



## The Science and Citizen Science

What makes a solar eclipse so [exciting to scientists](#) is that it provides the chance to observe the Sun's inner corona, which is the part of the Sun's atmosphere located just above the "surface" of the Sun. Since the path of totality for this eclipse passes along land for 90 minutes, it is a rare opportunity for scientists—and citizen scientists—to make extended observations of a portion of the Sun that can only be seen during a natural solar eclipse. For a collection of projects that you might want to consider doing with your students, visit the [Citizen Science page](#) of the NASA Eclipse site.

## Live streaming from the "path of totality"

If you and your students are not able to experience a total eclipse where you are, there are multiple options for online viewing that you can show in your classroom or on mobile devices:

- For four hours surrounding the eclipse, NASA will host an [Eclipse Megacast](#) providing unique broadcast coverage across multiple sites across the country. This is a hosted and narrated experience that will offer students interaction with scientists via social media.
- The Exploratorium will be filming the event from two different locations and live streaming it globally, including one stream that is just the visual eclipse with no narration, allowing you and your students to discuss what you are seeing. Audiences can join on [this website](#).

## One more thing...

We keep hearing one thing loud and clear from the experts -- **enjoy the experience!** Feel the coolness as the Moon covers the Sun, listen to the quieting of the animals and people around you, and think about the uniqueness of this solar eclipse. You don't have to take pictures of the actual eclipse (there are a lot of professionals doing this—and better). However, [eclipse selfies](#) are another matter...

## Is there PD and further teacher support?

On April 19th, 2017, WGBH hosted a live teacher webinar and Q&A with a NASA scientist to help teachers with their solar eclipse planning! The webinar covered additional resources and strategies for bringing the eclipse into your classroom, school or community! View the archived recording [here](#).

## #TeachEclipse2017

You can also ask us questions ANYTIME about teaching the eclipse using #TeachEclipse2017 on Twitter or posting a question on our [Facebook page](#).

## Teacher Eclipse Work/share Space

Have an idea or lesson plan for what to do with your students surrounding the Solar Eclipse of Aug 21, 2017? Want to share it with other teachers, or get some ideas from others? [This document](#) offers a planning and sharing space for K-12 teachers that accompanies the resources found in this Toolkit.

## **My experience teaching with an eclipse**

I was a brand new high school teacher in Sept 1996 when I faced an eclipse opportunity (a lunar eclipse). Teaching physics and astronomy in New York City, I was looking for ANY chance to get my students to observe something astronomical through the city lights. I discovered a lesson where students could use simple tools and a geometric calculation to calculate the distance between the Earth and the Moon (thank you Aristarchus). I partnered with the Geometry teacher and we had the entire 10th grade class on the school field that night to experience a lunar eclipse and a math and science lesson. It was a great way to get to know the other teachers in my school—but I will never forget hearing all the yells from the students as they discovered that geometry “works” on their own under a full moon.