GENERATIONGENIUS
ALWAYS QUESTION. ALWAYS WONDER.

TEACHER GUIDE

SOLAR AND LUNAR ECLIPSES
GRADES 6-8

COMMON MISCONCEPTIONS

- **Earth's axis points in different directions as it rotates.**
  The axial tilt of Earth is always pointing toward the same location in space. The Earth currently has an axial tilt of about 23.5° in relation to the stationary orbital plane throughout the year.

- **An eclipse happens every time the Moon orbits between the Earth and the Sun.**
  The Moon's path around Earth is tilted compared with Earth's orbit around the Sun. The Moon can be behind the Earth but still get hit by light from the Sun because of this 5° tilt.

- **A solar eclipse produces harmful rays that can cause blindness.**
  Being 1 million times fainter than the light from the Sun itself, coronal light contains nothing that could cause blindness. However, if you look directly at the solar surface before totality, the bright light can cause retinal damage as it can any other time you look directly at the Sun.

THE EARTH-SUN-MOON SYSTEM

The Earth-Sun-Moon system can be used to explain many daily, monthly, yearly and longer cycles we observe on Earth. These cycles including the phases of the moon, solar and lunar eclipses, low and high tides, and the pattern of constellations in the night sky. These cycles can be explained by the motion of the Earth, Sun and Moon and their position relative to one another.

SOLAR ECLIPSE

A solar eclipse occurs when the Earth, Sun, and Moon are in alignment and the Moon is positioned between the Sun and Earth. The Moon fully or partially blocks sunlight casting a shadow on Earth. A solar eclipse can be viewed only from a relatively small area of the world (depending on where the shadow is being cast) and lasts only a few minutes because of the smaller size of the Moon's shadow.

LUNAR ECLIPSE

A lunar eclipse occurs when Earth, the Sun, and the Moon are in alignment and Earth is positioned between the Sun

and the Moon. Earth fully or partially blocks sunlight, casting a shadow on the Moon. A lunar eclipse can be viewed from anywhere on the night side of Earth and can last up to nearly 2 hours because of the larger size of Earth's shadow.

TEACHER TIPS

As students build and draw models of the Earth-Sun-Moon system, use guiding questions to help facilitate the sensemaking process. Sensemaking is actively trying to figure out how the world works. In this lesson, students manipulate physical models and draw models to help develop an understanding of the science ideas necessary to explain solar and lunar eclipses.

ABOUT THIS LESSON

This lesson was created by the National Science Teaching Association (NSTA) to pair with the Generation Genius video and support *NGSS*.

They have requested we provide the following background with this lesson:

The Next Generation Science Standards (NGSS) are the national standards on how students learn science, and they are based on contemporary research presented in *A Framework for K–12 Science Education (the Framework).* The shift in science teaching and learning required by the Framework is summarized in this infographic: A New Vision for Science Education.

At the start of each Generation Genius lesson, students are presented with a phenomenon, then they try to explain it. Students will notice they have gaps in their knowledge and ask questions, which motivates them to build ownership of science ideas they need in order to explain how or why the phenomenon occurred. The way students build ownership of science and engineering ideas is through active engagement in the science and engineering practices (SEPs). This process of sensemaking, or doing science to figure out how the world works, is one of the major shifts the *Framework* encourages.

To engage in the SEPs, students should be part of a learning community that allows them to share their ideas, evaluate competing ideas, give and receive critiques, and reach consensus. Students can start by sharing ideas with a partner, then with a small group, and finally, with the whole class. This strategy creates opportunities for all students to be heard, build confidence, and have something to contribute to whole-class discussions. Each Generation Genius lesson provides conversational supports to facilitate such productive student discussions to contribute to sensemaking.

Excited to continue your shift toward the new vision for science education? Check out the Generation Genius Teacher Guide page on the NSTA website for resources and strategies to engage every student in your classroom in **doing** science.