GENERATIONGENIUS
ALWAYS QUESTION. ALWAYS WONDER.

LESSON PLAN

SOLAR AND LUNAR ECLIPSES
GRADES 6-8

SUMMARY

Students will develop and use Earth-Sun-Moon system models to describe the patterns of the eclipses of the Sun and Moon.

NEXT GENERATION SCIENCE STANDARDS CORRELATION

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.

Science & Engineering Practices	Connections to Classroom Activity
Developing and Using Models	• Students use foam balls to create a model of the Earth-Sun-Moon system and use the model to explain the pattern of shadows observed during the July 2, 2010 solar eclipse. They then represent the model on paper.

Disciplinary Core Ideas	Connections to Classroom Activity
ESS1.A: The Universe and Its Stars Patterns of the apparent motion of the Sun, the Moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1) **ESS1.B: Earth and the Solar System** This model of the solar system can explain eclipses of the Sun and the Moon. Earth's spin axis is fixed in direction over the short term but tilted relative to its orbit around the Sun. (MS-ESS1-1)	• Students use foam balls to create a model of the Earth-Sun-Moon system and use the model to explain the pattern of shadows observed during the July 2, 2010 solar eclipse. They then represent the model on paper.

Cross Cutting Concepts	Connections to Classroom Activity
Patterns	• Students use foam balls to create a model of the Earth-Sun-Moon system and use the model to explain the pattern of shadows observed during the July 2, 2010 solar eclipse. They then represent the model on paper.

DURATION

90 min.

MATERIALS

- Small foam balls
- Large foam balls
- Wooden skewers
- Notebooks
- Whiteboard or poster paper

ENGAGE

Show students the two videos below that provide a view of Earth from space during the July 2, 2019, solar eclipse. Make sure to show both videos (each one is only a few seconds long). The animation will help students identify the different shadows in the satellite view.

1. Total solar eclipse July 2, 2019 animation
2. Geo-Color full-disk view of the July 2, 2019, total solar eclipse as seen from GOES-East

Ask students to record observations while viewing the videos. Give students an opportunity to turn and share their observations with a partner before asking them to share their observations with the class. Record students' noticings on poster paper, a whiteboard, or other location accessible to all students.

Put students in small groups and prompt them to write down questions they have about the July 2, 2019, solar eclipse as seen from space. Ask student groups to share their top three questions with the class.

EXPLORE

Tell students we are going to try to create a model to explain our observations of the July 2, 2019, solar eclipse using a small foam ball to represent the Moon and a large foam ball to represent Earth.

Provide groups of students with a small foam ball on a wooden skewer to represent the Moon and a larger foam ball on a wooden skewer to represent Earth. Take students outside to use the Sun, "Earth," and "Moon" to try and replicate the shadows they observed in the animations. A lamp may be used indoors on a cloudy day.

While students are exploring with the components of the model, facilitate student sensemaking using guiding questions such as the following:

- How are you representing the motion of Earth?
- How are you able to create a shadow moving across Earth from west to east? East to west?
- How are you representing the motion of the Moon?
- What are the relationships between the components of your Earth-Sun-Moon system?

EXPLAIN

Bring students back inside the classroom and ask them to revisit the class list of questions and discuss in small groups the answers they were able to figure out. Have each group share with the whole class a question they were able to answer using their foam ball models. Record any new questions students have after creating a model of the July 2, 2019, solar eclipse.

WATCH THE GENERATION GENIUS SOLAR AND LUNAR ECLIPSES VIDEO AS A GROUP

End of Day 1

ELABORATE

After watching the video, have students work independently or in small groups to draw a model to explain the pattern of shadows on Earth during the July 2, 2019, solar eclipse based on information from the video and evidence from their foam ball models. Prompt students to label each component (part) and show the relationships that exist between the components. For example, arrows can be used to show motion of the Moon relative to the Earth.

Guiding questions can be used again to support students in creating their models. Post group models and ask students to do a gallery walk. Each group should visit a minimum of three other models and note similarities and differences between their models and the other groups. Give groups time to revise their models after the gallery walk.

EVALUATE

There are multiple ways to assess your students understanding of this topic. The exit ticket is an opportunity for students to use the science ideas they built in the lesson in a new context. Alternatively, you can use the Kahoot! quiz (which provides downloadable scores at the end of the game) and/or the paper quiz. All these resources are located right below the video in the assessment section.

EXTENSION

Challenge students to create a model to explain why lunar eclipses occur during full moons. Students might also create a model to predict what time of day they would see the different phases of the Moon—including lunar and solar eclipses—from their location on Earth.