Solar Eclipse Exploration

Study concepts related to a solar eclipse like motion and light principles.

LEGO® elements depicting the Sun, the Moon, and Earth are not to scale with reality and are a representation of the scientific phenomena.

Project Overview

Solar Eclipse Exploration

Created by Jillian Johnson

Jillian Johnson is a STEM Education Professional in Orlando, Florida. With over ten years of teaching, she earned a master's degree from the University of Central Florida in Instructional Design and Educational Technology. Jill was named Curriculum Associates Extraordinary Educator 2022 and a LEGO® Education Ambassador for 2024. She has participated in global webinars, expert panels, and educational podcasts with companies such as Tech & Learning, Curriculum Associates, Symbaloo, and LEGO Education. Presently, Jill writes STEM focused curriculum, presents at educational conferences, and works as a Reading and STEM Integration Specialist for Orange County Public Schools.

Introduction

On Monday, April 8, 2024, a total solar eclipse will be seen in parts of the U.S. from Texas to Maine. All of North America will have at least a partial solar eclipse, if skies are clear.

What is a Solar Eclipse?

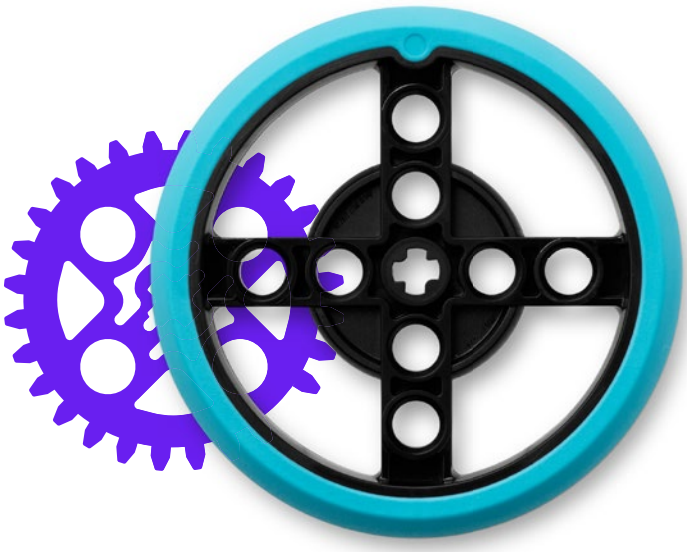
A solar eclipse happens when the Moon passes between Earth and the Sun, casting a shadow on Earth's surface and some portion of the Sun is covered by the Moon.

Activity Overview

In this activity, there are four mini missions to explore eclipses, including printable student sheets. Although designed for elementary students, this activity is flexible and can easily be adapted for the grades and subjects you teach. You can use LEGO® bricks, full LEGO® Education sets, or any materials you already have in the classroom. Students will be able to understand concepts of a solar eclipse, while also being able to design and engineer a model to simulate an eclipse using motion and light principles.

Solar Eclipse Exploration Mini Missions

- Mini Mission #1: What is the Sun?
- Mini Mission #2: What is the Moon?
- Mini Mission #3: Shadows & Eclipses
- Mini Mission #4: Eclipse Safety



SOLAR ECLIPSE MINI MISSION #1

What is the Sun?

ENGAGE

The Sun is a star. It is the closest star to Earth, which is why it looks bigger and brighter than other stars. The Sun is so big and bright that you typically cannot see other stars during the day.

EXPLORE

Provide students with LEGO bricks or engineering materials to create a model of the Sun. Their goal is to make the Sun look as accurate as possible with a way to light up, either by using a light sensor from LEGO® Education SPIKE™ Essential kit, or any other source of light, such as a flashlight or lamp.

EXPLAIN

Ask students to take turns demonstrating their models. Consider asking questions like:

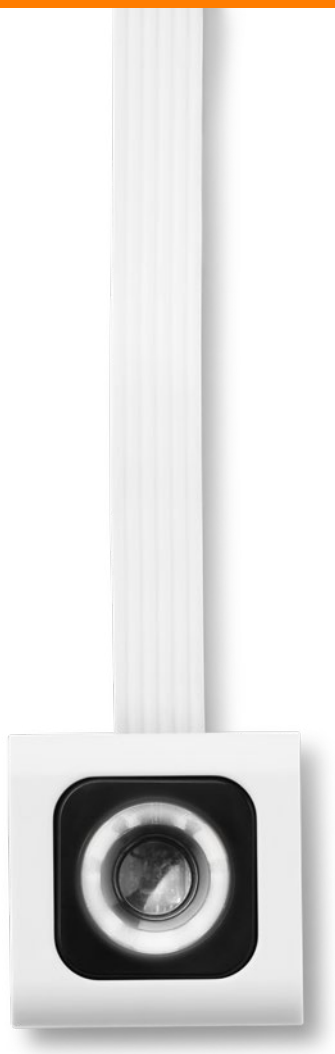
- How did you make your model light up?
- Did you have to rebuild some parts?
- What was the most challenging part during this build?
- What was the most successful part of this build?

ELABORATE

Have students create a model of Earth to go with the Sun they created. Discuss the differences between the models and real-life. To understand the size difference, explain that one million Earths could fit inside the Sun. This can be demonstrated with a basketball and one grain of sand, or a large beachball and a peppercorn. Discuss how this concept relates to the models created.

EXTEND

You can see other stars at night. They look smaller than the Sun because they are very far away. Have students combine their models to replicate the Sun being one of many stars in our universe and explore how the lights appear different in the room with other lights on and off.



The Sun

SOLAR ECLIPSE MINI MISSION #1

What is the Sun?

Mission Objective

Create a model of the Sun using the available materials.

MY PLAN

NOTES ABOUT MY DESIGN

SOLAR ECLIPSE MINI MISSION #2

What is the Moon?

ENGAGE

The Moon is the brightest object we can see in the night sky and moves in an orbit around Earth. It takes about four weeks for it to make one orbit around our planet. Throughout the orbit, the Moon can be seen in different phases, or apparent shapes, because we are seeing the light from the Sun fall on the Moon in different ways as it is orbiting around us.

The Moon

EXPLORE

Provide students with LEGO bricks or engineering materials to create a model of the Moon. The goal is to make the Moon look as accurate as possible with a way to have the Moon orbit or move in a certain path around something, either by using a motion sensor from the SPIKE Essential kit, or another source of motion.

EXPLAIN

Ask students to take turns demonstrating their models. Consider asking questions like:

- How did you make your model orbit or show motion?
- What was the most challenging part during this build?
- What was the most successful part of this build?

ELABORATE

Have students create a model of Earth to go with the Moon and Sun they created, applying that one million Earths could fit inside the Sun.

EXTEND

For an extra challenge, have students determine how far away Earth and the Moon should be in relation to the Sun and other planets. Students can demonstrate the motion and distances in relation to the orbits of the Moon and Earth with the Sun.

SOLAR ECLIPSE MINI MISSION #2

What is the Moon?

Mission Objective

Create a model of the Moon using the available materials.

MY PLAN

NOTES ABOUT MY DESIGN

SOLAR ECLIPSE MINI MISSION #3

Shadows and Eclipses

ENGAGE

An eclipse happens when one object in space, like a planet or moon, passes through the shadow of another object. Ask students if they've ever used anything to block sunlight when they were outside, such as going behind a tree or holding up a hand for shade from the Sun.

EXPLORE

Provide students with LEGO bricks or engineering materials to create different objects to block out a source of light and create a shadow. The goal is to cast a specific shape on a piece of paper by blocking out light to explore the concept of shadows. Students will explore how the variations of the shapes affect the shadow cast and the silhouette.

EXPLAIN

Ask students to take turns demonstrating their models. Consider asking questions like:

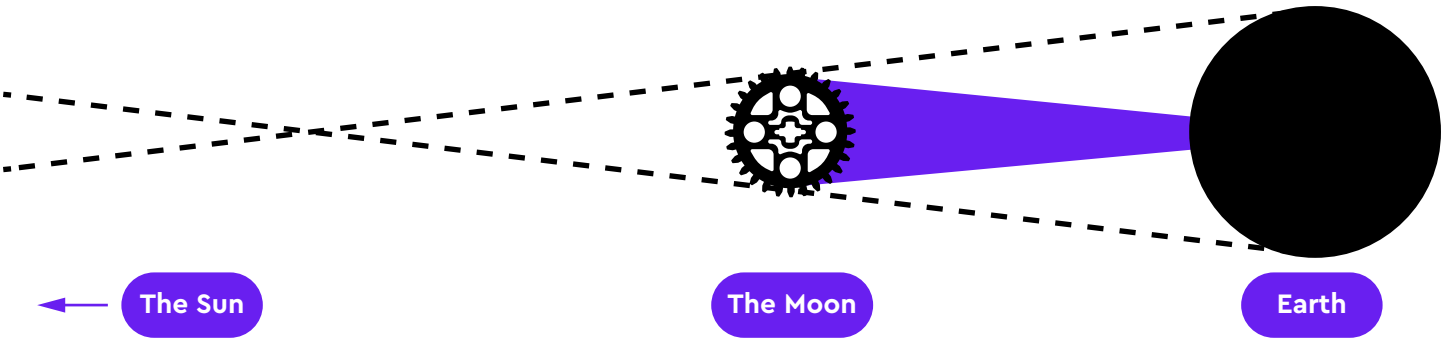
- How did you determine the distance of the objects?
- Did the shape outline match the shape of your object blocking the light?
- What was the most challenging part during this build?
- What was the most successful part of this build?

ELABORATE

What we see from our perspectives on Earth can change depending on the distance, size, and shape of the other objects around. Discuss the differences between a total and partial eclipse and the differences between lunar and solar eclipses.

EXTEND

Discuss the importance of safety when observing an eclipse. Learn how to safely observe a solar eclipse by either setting up a pinhole camera or securing a class set of eclipse glasses.



SOLAR ECLIPSE MINI MISSION #3

Shadows and Eclipses

Mission Objective

Create a shape to cast a shadow on a piece of paper by blocking out light to explore the concept of shadows.

MY PLAN

NOTES ABOUT MY DESIGN

SOLAR ECLIPSE MINI MISSION #4

Eclipse Safety

ENGAGE

During partial or annular solar eclipses, it is never safe to look directly at the eclipse without proper eye protection. When watching a partial or annular solar eclipse directly with your eyes, you must look through safe solar viewing glasses ("eclipse glasses") or a safe handheld solar viewer at all times. Eclipse glasses are NOT regular sunglasses; regular sunglasses, no matter how dark, are not safe for viewing the Sun. Learn about total eclipse safety from NASA resources.

EXPLORE

Watch this video on how to make a box pinhole projector to safely view the eclipse. Provide students with LEGO bricks or engineering materials to design a pinhole camera model. Their goal is to make a pinhole projector to project sunlight through the holes onto a surface and look at the solar image on the surface.

EXPLAIN

Ask students to take turns demonstrating their models. Consider asking questions like:

- Why did you make your model in the shape you did?
- What was the most challenging part during this build?
- What was the most successful part of this build?

ELABORATE

Have students use the model of the Earth, Moon, and Sun they created, applying the concepts of eclipses and pinhole projection. For an extra challenge, have students demonstrate a pinhole projection image shown on their Earth model.

EXTEND

You can also use a telescope or binoculars to project images of the partially eclipsed Sun onto a surface. This is called optical projection because it involves optics (that is, lenses and/or mirrors).

SOLAR ECLIPSE MINI MISSION #4

Eclipse Safety

Mission Objective

Design a pinhole projector model to project sunlight through the holes onto a surface and look at the solar image on the surface.

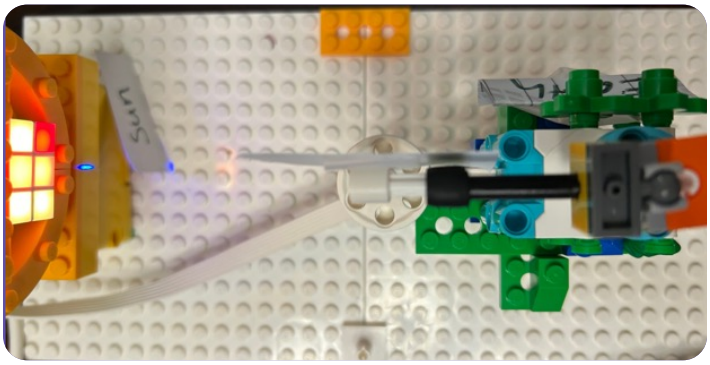
MY PLAN

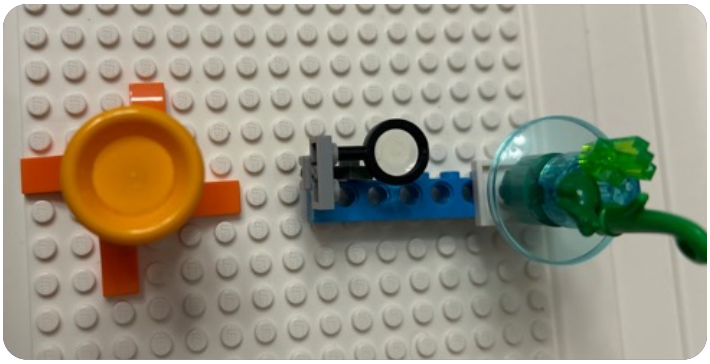
NOTES ABOUT MY DESIGN

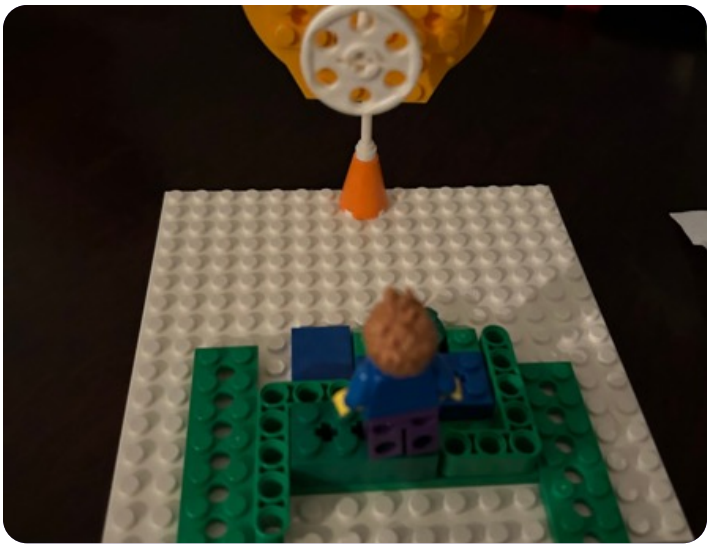
Solar Eclipse Simulation Models

After completing the Solar Eclipse Exploration activities, students will be able to understand concepts of a solar eclipse, while also being able to design and engineer a model to simulate an eclipse using motion and light principles.

Here are some student builds for inspiration:







Share your students' builds with #LEGOeduEclipse

LEGOeducation.com/eclipse