MODELLING ECLIPSES WITH BALLS

Brief Description

Students use balloons representing the Earth and the Moon to simulate eclipses. Ideally, this activity is done outside with the real Sunlight. Otherwise, it can be done indoors with a lamp.

School level: Primary (can be used as a demonstration for older children)
Preparation time: 10 minutes to inflate the balloons, if necessary
Duration: 20 minutes
Keywords: eclipse, Earth, Moon, Sun, lunar eclipse, solar eclipse

Educational Goals

- Imagine the Earth and the Moon as two celestial objects in space.
- Model the positions of the Earth, Moon, and Sun during lunar and solar eclipses.

Materials

- ❒ Large balloons for the Earth (we suggest the Earth ball, often available in science stores)
- ❒ Small balloons or balls for the Moon
- ❒ A bright lamp for the Sun, if the activity is done indoors. *We recommend doing the activity outside and using the real Sun.*

Ideally, students will do this activity in teams of 2-3; be sure to have enough balls for each team (one Moon and one Earth per team). If this is not possible, you can do this as a demonstration with a large group.

If you want to have the Moon and the Earth to scale (this is not necessary), you need a Moon whose diameter is between 3 and 4 times smaller than that of the Earth. For example, with an Earth measuring 30cm (12in – the size of a standard globe), the Moon is a ball about 8cm, similar to a baseball.

Introduction

Eclipses are caused by a play of shadows between the Earth and the Moon. The best way to understand them is to model them with balls. It is easy to project the shadow of the Moon on the Earth (solar eclipse) and the shadow of the Earth on the Moon (lunar eclipse).

Most young students very rarely think of Earth as a celestial object in space. It is therefore important to start the activity by presenting the celestial objects and discussing them in simple terms.

Preparation

Find enough balloons and balls to represent the Earth and the Moon.

A student who models a solar eclipse by projecting the Moon's shadow onto the Earth

Process

1. Introduce our planet, Earth. To make it more concrete, especially with the little ones, you can identify the continents and where you are located. Make a connection with the fact that what is under our feet is this large sphere.

2. Introduce the Moon, which is our natural satellite, meaning it orbits (rotates) around the Earth.

3. Form teams and give each team an Earth and a Moon.

4. Depending on the level of the students, you can more or less guide them so that they model a solar eclipse and a lunar eclipse:

    a. Are you able to create a solar eclipse? How should the Earth and Moon be placed in relation to the Sun?
    b. Are you able to create a lunar eclipse? How should the Earth and Moon be placed in relation to the Sun?
    c. Does the Moon's shadow cover the entire Earth? Does the Earth's shadow cover the entire Moon?
    d. Does the Moon move around the Earth? How does this affect the position of his shadow? During your eclipse, what would people on Earth see?
        i. By moving the Moon during a solar eclipse, we create the band of totality, the area on Earth that would see the total eclipse.

Taking it Further

If you'd like, you can include the movement of the celestial bodies into your model. Ask students to represent the movement of the Moon and Earth and, if they know, how long their orbits can take.

Model of a solar eclipse, with the shadow of the Moon-ball on Earth.

The Moon revolves around the Earth which revolves around the Sun. You can also add the rotational movement of the Earth on its axis.

- Rotation of the Earth on its axis: one day (23h 56min)
- Rotation of the Earth around the Sun: one year (365.25 days)
- Rotation of the Moon around the Earth: 27.3 days

Inspiration

Exploring the Solar System: Solar Eclipse from the National Informal STEM Education Network.