Eclipse the lollipop

Modelling eclipses of the moon and the Sun with a ball, lollipops and a bright light

Set up the equipment as in the Earthlearningidea 'Lollipop moon' by putting a tennis-ball-sized ball on a flat surface, but this time stand it on two or three rolls of tape. Then set up a bright light like a projector or a desk lamp, to shine on the ball. Take eight lollipops and use clay, modelling clay or Blu tac™ to place them as shown in the photos. One lollipop should be between the light and the ball, two at right angles to the ball and one behind it. Put the others in between to make a circle around the ball. Ensure that the beam of light aims directly at the ball, so that the first lollipop throws a shadow on the ball and the lollipop behind the ball is in shadow.

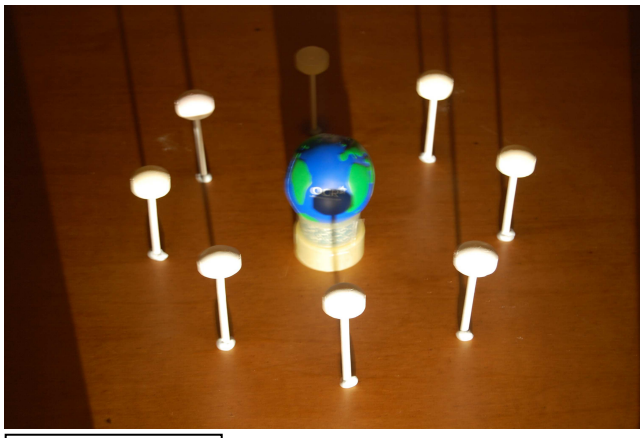


Photo: Chris King.

Explain that an eclipse of the moon occurs when the shadow of the Earth falls on the moon so that it becomes dark. Then explain that an eclipse of the Sun occurs when the moon comes between the Earth and the Sun, covering up the Sun, as seen from Earth.

Ask the pupils:

- which of the lollipops in the model is simulating an eclipse of the moon (a lunar eclipse);
- which of the lollipops is simulating an eclipse of the Sun (a solar eclipse);
- where on the model Earth will a total eclipse of the Sun will be seen?
- where on the model Earth will a partial eclipse of the Sun will be seen?
- whether or not the eclipse of the moon in the model is a total or a partial eclipse.

Explain how this model differs from the similar 'Lollipop moon' Earthlearningidea model used to show phases of the moon. In this 'eclipse activity' the 'moons' are aligned in the 'Sun's' beam, whereas during the normal lunar cycle, the moon is circling at an angle to the Sun's rays.

Follow this activity up with the Earthlearningidea, 'Why does the Sun disappear?' to help pupils to visualise for themselves how the gigantic Sun can be totally eclipsed by the much smaller moon during a solar eclipse.

Using the 'Moon' to block out the 'Sun in the 'Why does the Sun disappear' Earthlearningidea activity.

Photo: Peter Kennett.

The back up

Title: Eclipse the lollipop

Subtitle: Modelling eclipses of the moon and the Sun with a ball, lollipops and a bright light

Topic: Pupils use a model to appreciate what lunar and solar eclipses look like when viewed from outside the Earth.

Age range of pupils: 10 – 16 years

Time needed to complete activity: 15 mins

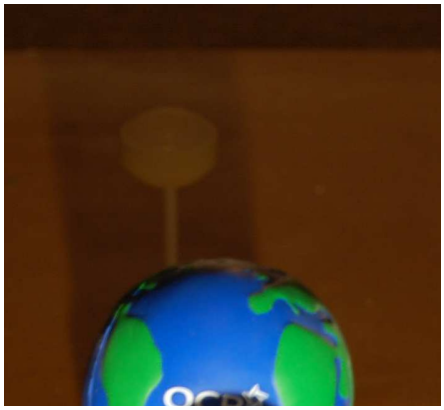
Pupil learning outcomes: Pupils can:

- use a ball model to explain solar and lunar eclipses and partial eclipses;
- explain how the eclipse situation differs from normal lunar circulation.

Context:

As in the 'Lollipop moon' Earthlearningidea activity, pupils are shown a ball model using a tennis-sized ball for the Earth and lollipops to represent the different positions of the moon as it travels anticlockwise around the Earth (when viewed from above the Northern Hemisphere).

However, here the light is aligned with the plane of rotation of the 'moon'. This allows a lunar eclipse to be demonstrated, as the shadow of the 'Earth' falls on the 'moon', giving a total eclipse of the moon, as shown in the photo below:



A solar eclipse is seen where the shadow of the 'moon' falls on the Earth, as in the photo below:

Model eclipse photos: Chris King.

People completely within the shadow of the moon on the Earth would see a total solar eclipse, whilst those on the edge of the shadow would see a partial eclipse.

Following up the activity:
As suggested above, follow up this activity with the Earthlearningidea, 'Why does the Sun disappear?'

Underlying principles:

- A lunar eclipse occurs when the shadow of the Earth, cast by the Sun, falls on the moon.
- A solar eclipse occurs when the shadow of the moon falls on the Earth, the eclipse is total in the shadow, but those on the edge of the shadow would see a partial eclipse
- Eclipses occur when the plane of the circle of rotation of the moon is in line with the Sun; this is unusual, and most of the time the plane of circulation is not aligned with a line from the Earth to the Sun, allowing the normal phases of the moon to be seen.

Thinking skill development:
Visualising the eclipses from the model requires three-dimensional thinking ability and the pattern produced involves construction. Linking the model to reality requires bridging skills.

Resource list:

- a tennis-ball-sized ball, or similar
- two or three rolls of tape, upon which to balance the ball at the height of the lollipops
- 8 round pale-coloured lollipops, or similar
- clay, modelling clay or Blu tac™ to support the lollipops vertically
- a strong light source, such as a projector or desk lamp
- a darkened room

Useful links:
Type 'eclipse animation' into a search engine like Google™ to find animations of solar and lunar eclipses, with demonstrations of the causes.

Source: Devised by Chris King of the Earthlearningidea Team.

With thanks to Steve Adams, Sheffield Astronomical Society, for his advice.

The progression of thinking skills shown by the Earthlearningidea 'Moon' exercises

Earthlearningidea	Strategies and skills developed
Jaffa moon: modelling the phases of the moon using Jaffa Cakes™	• concrete observational, recording and modelling skills • predicting from a pattern – using construction skills
Polystyrene moon: visualising the phases of the moon using a ball on a stick	• 3D spatial skills, viewed from 'inside' the model
Lollipop moon: modelling the phases of the moon with a ball, lollipops and a bright light	• 3D spatial skills, viewed from 'outside' the model
Eclipse the lollipop: modelling eclipses of the moon and the Sun with a ball, lollipops and a bright light	• 3D spatial skills, viewed from 'outside' the model
Why does the Sun disappear? Demonstrate what happens when the Moon hides the Sun	• 3D spatial skills, viewed from 'inside' the model