The Earth, the Sun and the Moon

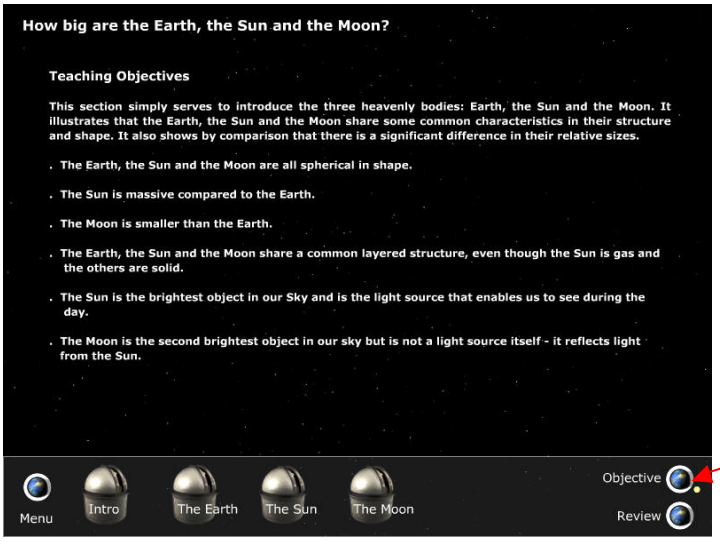
Overview

Introduction

The Earth, The Sun and The Moon is a software product, designed primarily for presentation on an interactive whiteboard. Teachers can use it as a knowledge base to support the teaching of Key Stage 2 unit 5e and pupils can use it as a research or revision tool.

The software is organised as six sections each one accessed by clicking a button on the main menu shown below:

Each Section has an objective and review page accessed by pressing buttons on the section menu. For example this is the one for section 1.



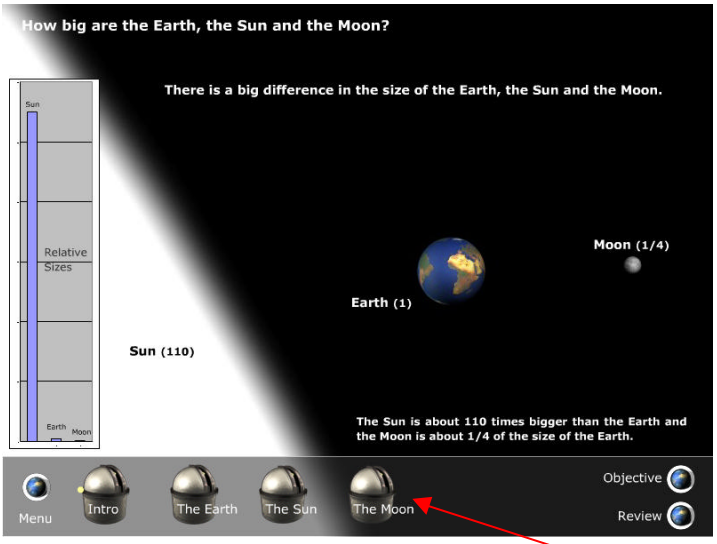
Objective and Review buttons

1 - How big are the Earth, the Sun and the Moon?

Teaching Objectives

This section simply serves to introduce the three heavenly bodies: Earth, the Sun and the Moon. It illustrates that the Earth, the Sun and the Moon share some common characteristics in their structure and shape. It also shows by comparison that there is a significant difference in their relative sizes.

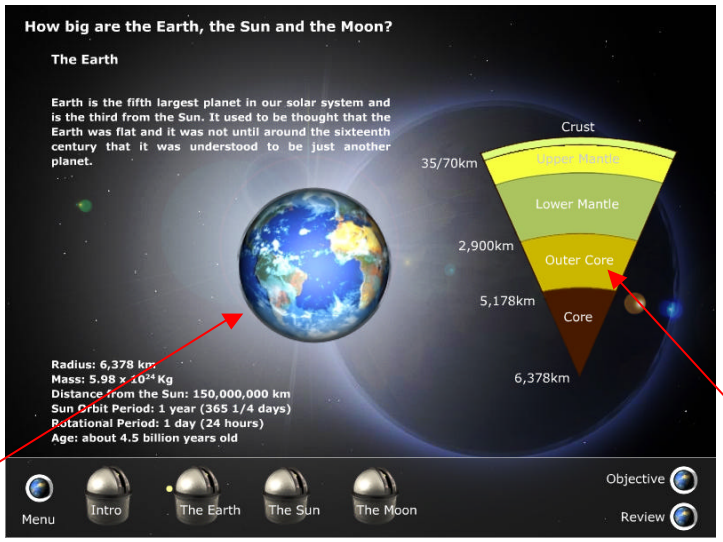
- The Earth, the Sun and the Moon are all spherical in shape.
- The Sun is massive compared to the Earth.
- The Moon is smaller than the Earth.
- The Earth, the Sun and the Moon share a common layered structure, even though the Sun is gas and the others are solid.
- The Sun is the brightest object in our Sky and is the light source that enables us to see during the day.
- The Moon is the second brightest object in our sky but is not a light source itself - it reflects light from the Sun.



Size comparisons using a simple graph, ratios and graphical representations.

Topics are selected by clicking the menu buttons at the bottom.

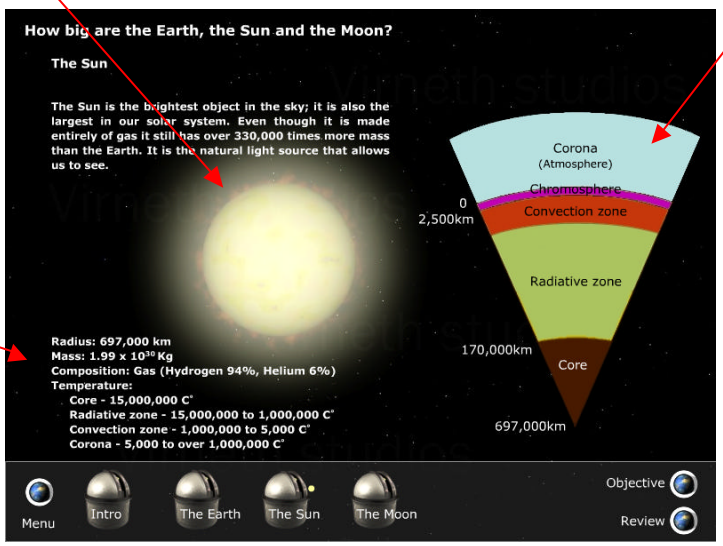
The content in this section is static and used simply as a reference to illustrate the topic.



Common spherical shape

Illustrates the layered structure

Data sheets describe the layered spherical structure of the Sun, the Earth and the Moon.



Facts about the planet

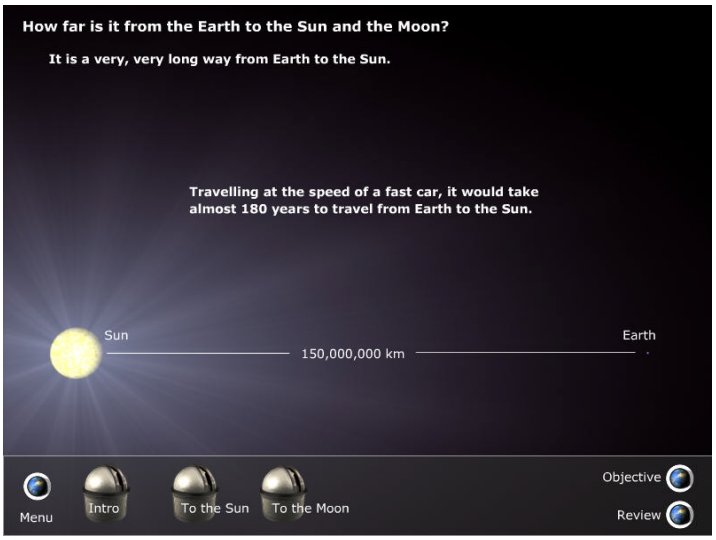
2 - How far is it from the Earth to the Sun and the Moon?

Teaching Objectives

Distances in space are huge - so much more than we are used to.

Using a simple reference to a common mode of transport - the car - this section shows that the distance between Earth, the Sun and the Moon are massive.

- Distances in space are huge and we sometimes have to use different ways of measuring these distances.
- Stars look very small but are really very big.
- It is a long way to the Moon.
- It would take a long time to get to the Moon and back travelling at speeds we are used to.
- It is a very, very long way to the Sun.
- Travelling at the speed of a fast car it would take more than a lifetime to get to the Sun.



Static images are used to illustrate the distances between the Earth, the Sun and the Moon

3 – What are orbits and gravity?

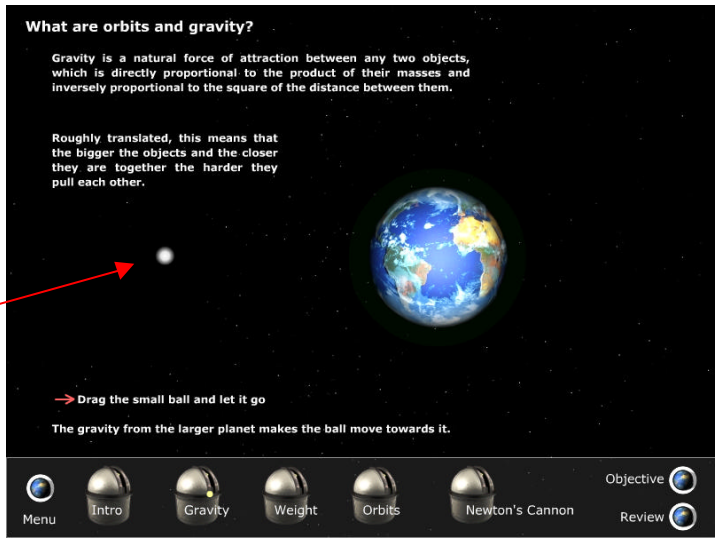
Teaching Objectives

Gravity is a force that acts on everything. It is what causes the Earth to orbit the Sun and the Moon to orbit the Earth.

This section demonstrates that objects attract each other and that large objects pull smaller objects towards them, and introduces the concept of an orbit due to gravitational force.

- Objects attract each other with a force that is proportional to the size of the mass of the objects.
- Objects don't fall down; they fall towards a larger source of gravity (usually the Earth).
- Gravity can cause one object to orbit another.
- Objects have mass (material) that does not change.
- Weight is caused by gravity acting on mass.
- An interactive model of Newton's Cannon is used to show that the speed of an object controls the height of an object's orbit.

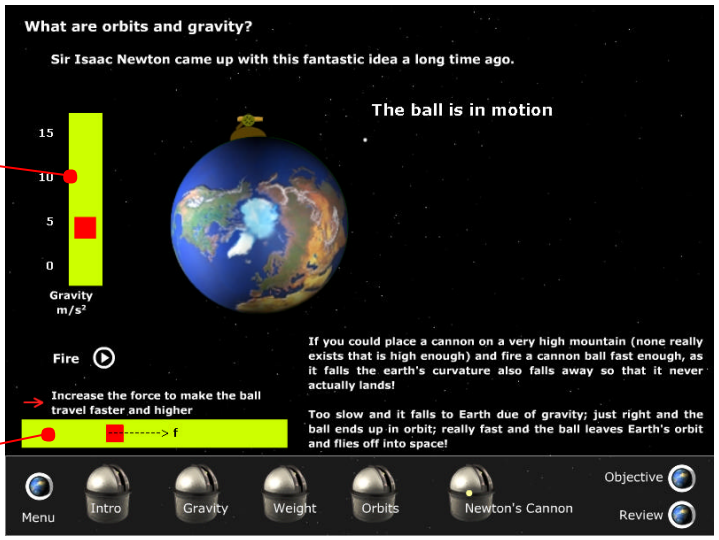
Drag the ball to any position and let it go



Interactive animation: drag the ball away from the Earth and let it go; the ball moves towards the Earth, even from below. The ball speeds up as it gets nearer to the Earth and the acceleration due to gravity increases.

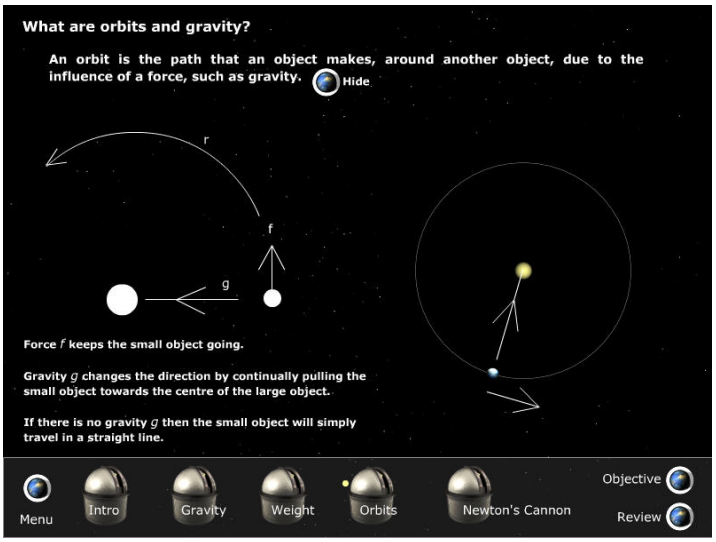
The gauge indicates the acceleration acting on the ball due to gravity, which increases as the ball gets closer to the Earth

Set the amount of force the cannon fires the ball with



Newton's Cannon – alter the amount of force with which the cannon fires the ball and see the effect on the ball's orbit; too little force and the ball falls to earth, too much and the ball zooms off into space.

Note the amount of gravity getting higher as the ball orbits nearer the Earth.



A dynamic illustration of the forces that make one body orbit another one.

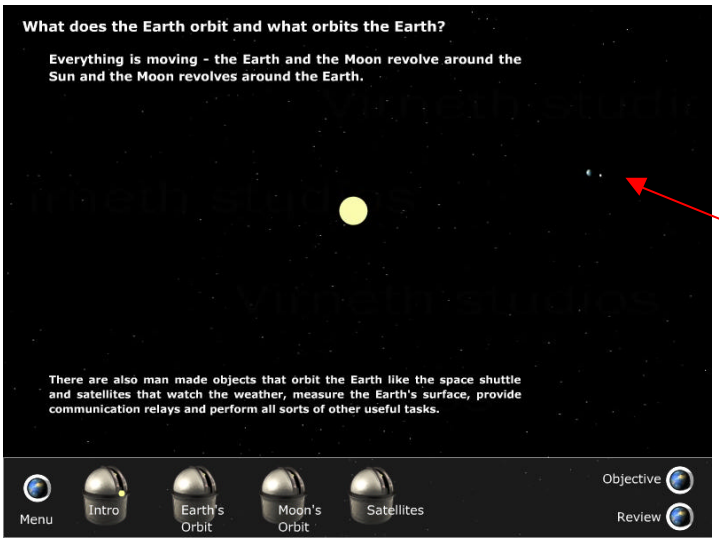
4 – What orbits the Earth and what does the Earth orbit?

Teaching Objectives

Earth is in orbit around the Sun and the Moon is orbiting Earth.

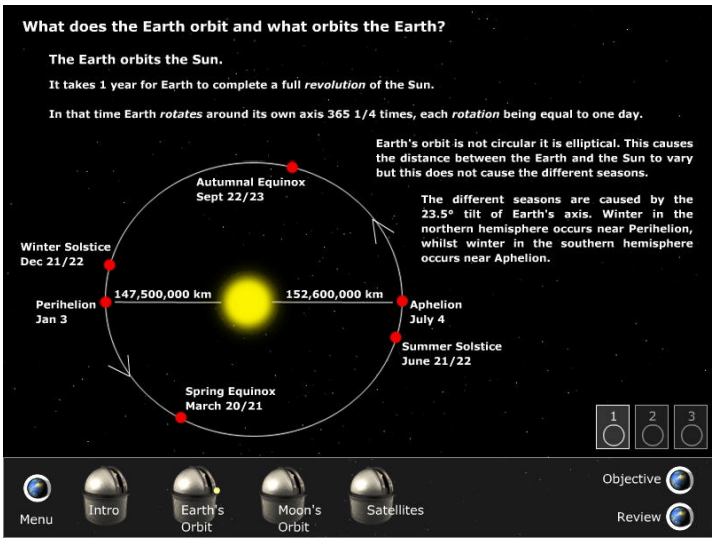
This section provides some detail about the nature of these orbits and also explains that there are also man made objects in orbit around Earth.

- The Earth moves in an elliptical orbit around the Sun and the Moon moves in a circular orbit around Earth.
- It takes the Earth a year to complete one orbit of the Sun and the Moon about 29.5 days to complete an orbit of the Earth.
- The Earth's axis is inclined at an angle to the plane of revolution around the Sun.
- As the Earth revolves around the Sun its axis stays pointing in the same direction and this causes the Sun to appear at different heights in the sky during the year.
- There are other, man made, objects in orbit around the Earth
- Man made satellites are not spherical like the Earth, Sun and Moon.

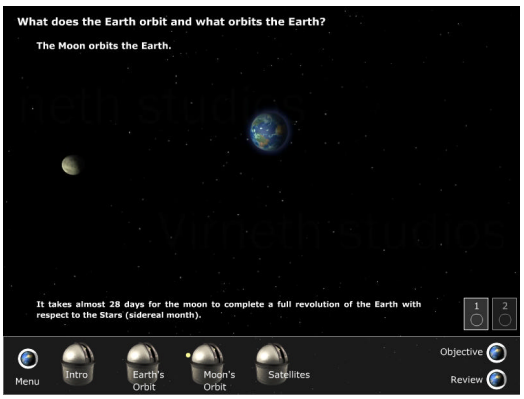


The moon revolves around the Earth as they both revolve about the Sun

See the Moon orbiting the Earth whilst they both orbit the Sun. Realistic shadows add to the effect.

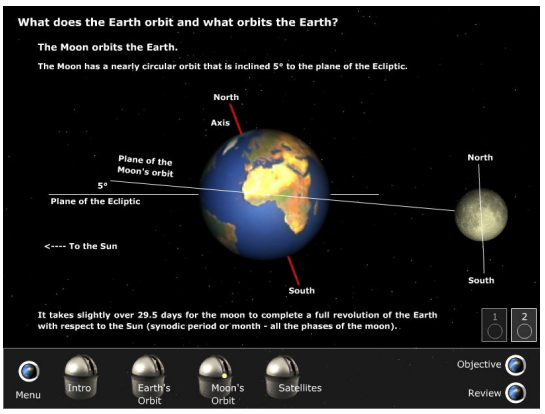


A diagram illustrating the elliptical nature of the Earth's orbit and that the distance from the Sun does not cause the temperature differences between Summer and Winter (we are almost half a million miles nearer to the sun during Winter)



Left: An animation of the Moon orbiting the Earth

Right: an illustration of the positional relationships between the Earth and the Moon



5 – How does the movement of the Earth and Moon affect us?

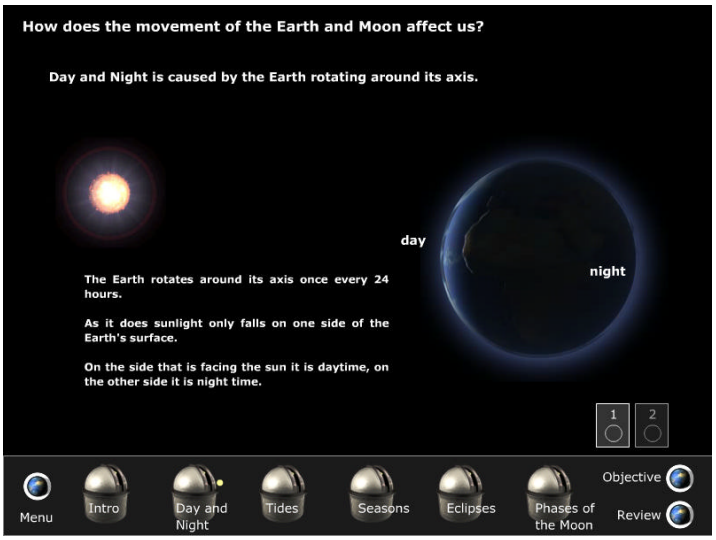
Teaching Objectives

The motion of the Earth, the Sun and the Moon has an affect on our lives.

This section establishes an awareness of this motion and creates an understanding of the effect that this has.

This is achieved by demonstrating some key concepts and dynamically illustrating the effects:

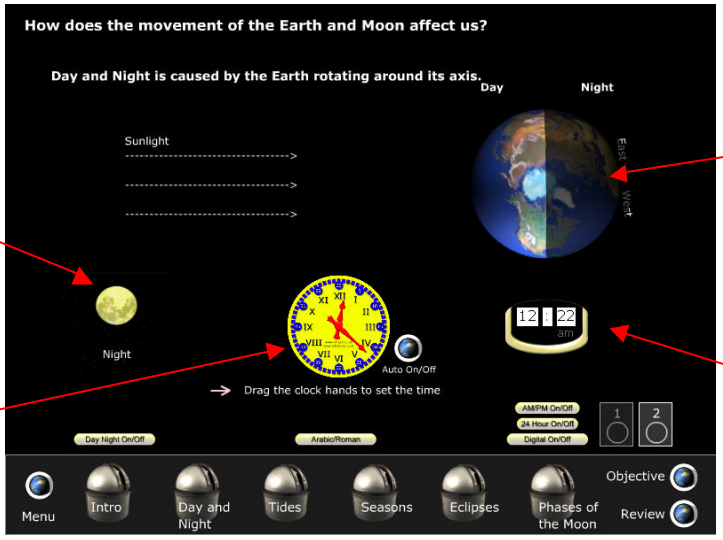
- The Earth rotates on its axis causing day and night.
- Gravity from the Moon and Sun pulls on the Earth's seas and oceans causing high and low tides.
- The Earth revolves around the Sun once every year causing different seasons.
- Eclipses and the phases of the Moon are caused by the different positions of the Earth, Sun and Moon.



An animation illustrating Day and Night. The Earth is rotating from the light into the shadow. This is a great opportunity to discuss why the Sun looks smaller than the Earth.

Day and Night indicator

Move the hands on the analogue clock to set the time or use the auto function. Roman or Arabic numerals.



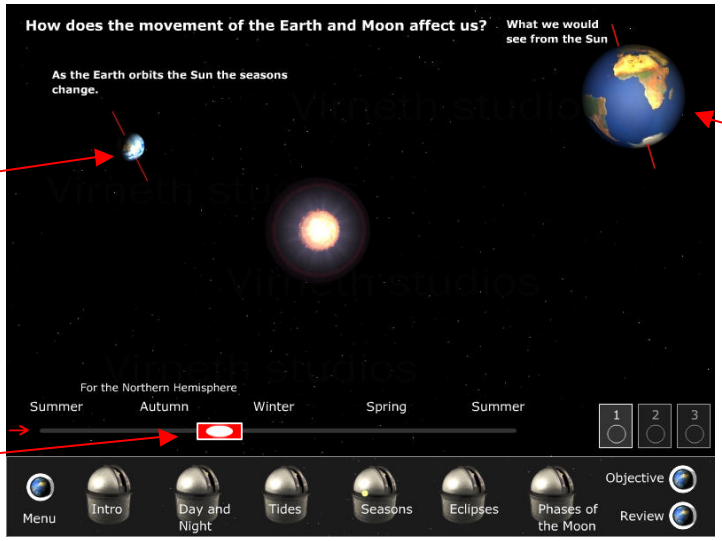
Earth rotates in time with the clock

Digital clock linked to the analogue clock. 24hr or 12hr display

A highly interactive animation linking the movement of the Earth to the time of day.

- Move the arms of the clock to set the time the Earth will rotate to the correct position.
- Auto function that rotates the clock hands and keeps the Earth and digital clock in sync.
- A digital clock linked to the analogue clock that can be switched between 12-hour and 24-hour displays.
- A choice of Arabic or Roman numerals on the analogue clock face
- An image that changes between day and night in sync with the earths rotation.
- Hide or display the Day/Night indicator and the digital clock as required

The Earth revolves around the Sun as the slider is moved

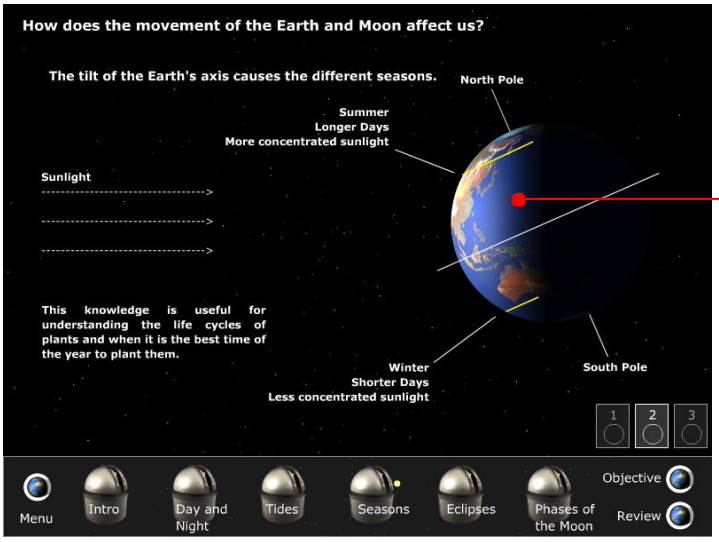


The Earth as seen from the sun

Move the slider to set the season

In this interactive animation you can set the slider to the time of year and the Earth will revolve to its respective position around the sun.

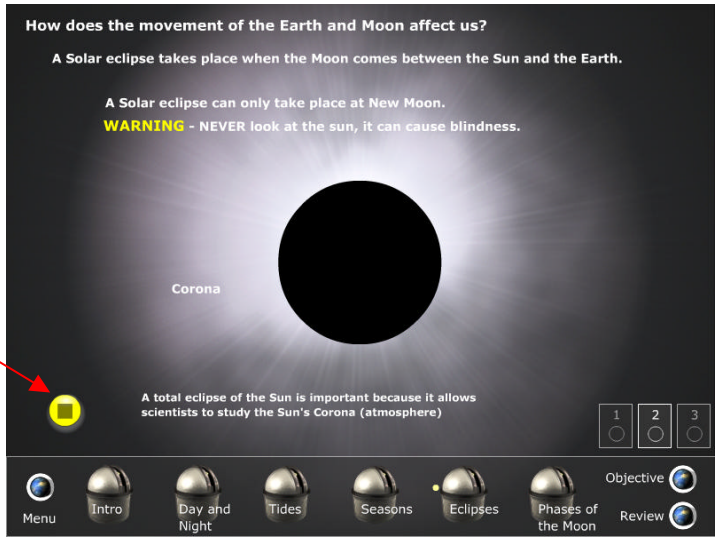
The view at the top right hand corner is what you would see for the sun. During winter you can hardly see Britain so you can quickly show why there is little light and heat reaching us at that time of year.



The Earth is rotating, which reinforces the message about the log/short days

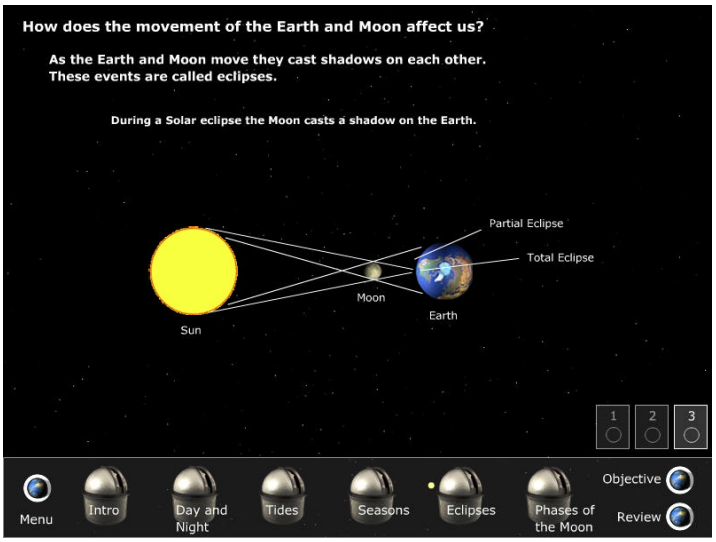
This animation supports the one above. It illustrates how the inclined axis of rotation causes the seasons. The earth is spinning to reinforce the feeling of realism.

The animation can be paused at any point in the playback – useful for discussion

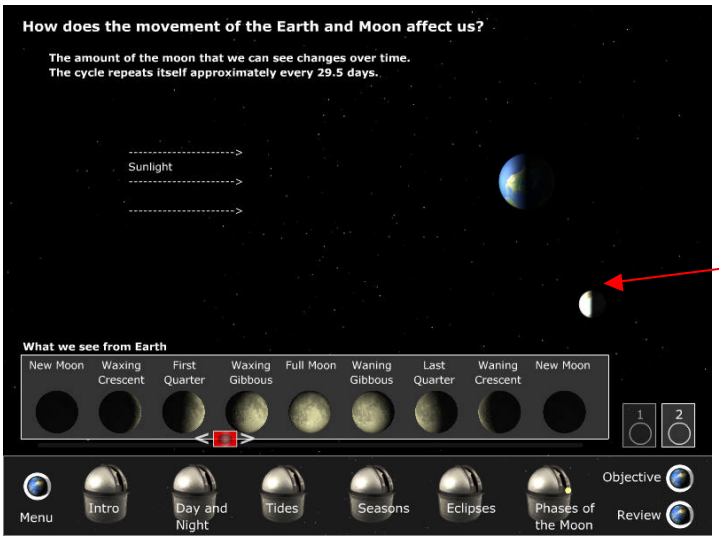


This is a still from an animation illustrating a solar eclipse. A safe and simple way to show the class an eclipse without waiting for an actual event and hoping the conditions are suitable.

There is also one that shows an eclipse of the Moon.



A static diagram explaining the cause of an eclipse. There is also one illustrating an eclipse of the moon. These are intended to support the animations of the eclipses.

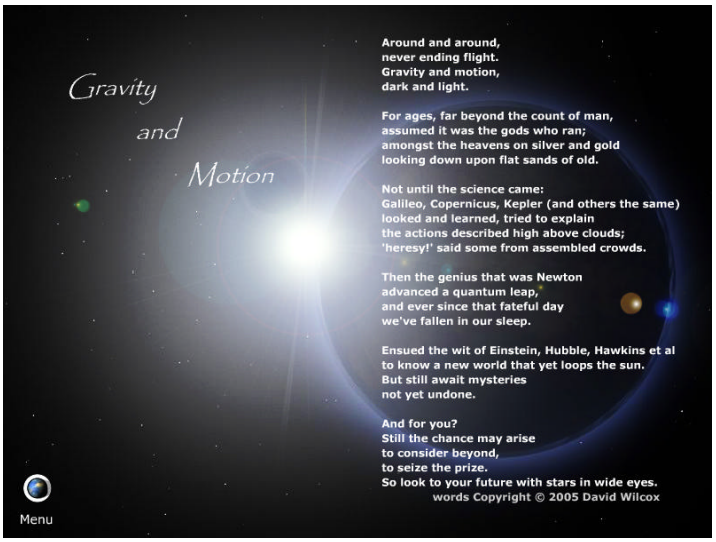


The Moon revolves around Earth as the slider is moved

This interactive animation can be used to simulate the phases of the moon.

As the slider is moved across the views at the bottom the Moon revolves around the Earth in the top view to explain how the shadows fall on the Moon.

6. Gravity and Motion – A poem



Finally a poem about gravity and motion. It serves to introduce some of the famous people associated with the subject over the years and acts as an inspiration for pupils to write their own.