

Unit 5E Earth, Sun and Moon

ABOUT THE UNIT

In this unit children learn about the shapes and relative sizes of the Earth, Sun and Moon. Using models they learn how the three bodies move relative to each other and how these movements relate to night and day.

Experimental and investigative work in this unit focuses on:

- making observations and recognising patterns in first hand and secondary data
- representing data in graphs.

Work in this unit offers opportunities for children to relate scientific knowledge and understanding to familiar phenomena *eg day length, year length* and to consider scientific evidence about the Earth, Sun and Moon.

A visit to a planetarium or of a 'starlab' can enhance the teaching of this topic.

This unit takes approximately 11 hours.

WHERE THE UNIT FITS IN

Builds on Unit 1D 'Light and dark' and Unit 3F 'Light and shadows'

Children need:

- to know that the apparent position of the Sun changes over the course of a day
- to know that shadows change in length and direction over the course of a day
- to know that shadows are formed when light is blocked
- to know the compass directions north, south, east and west
- to be able to present data in tables and bar charts.

Links with Unit 6F and geography.

VOCABULARY

In this unit children will have opportunities to use:

- words and phrases related to the shape and movement of the Earth and Moon *eg sphere, revolve, orbit, spin, rotate, axis, sunrise, sunset, north, south, east, west*
- nouns and associated adjectives *eg sphere/spherical*
- words and phrases which have similar but distinct meanings *eg rotate around, rotate on its axis, spin, orbit*
- expressions for generalising and summarising
- descriptions and explanations involving a sequence of ideas.

RESOURCES

- video or other secondary sources *eg photographs* of Earth taken from space
- photographs of Sun, Moon and Earth
- globe with small object attached
- secondary sources providing information about earlier ideas of the shape of the Earth
- selection of spheres of different sizes including a beach ball, pea and beads about $\frac{1}{4}$ size of a pea
- compass
- shadow stick
- torch with powerful beam
- secondary data about times of sunrise and sunset
- secondary sources providing information about how the appearance of the Moon changes over a 28-day period

EXPECTATIONS

at the end of this unit

most children will:

recognise that the Earth, Sun and Moon are spherical and support this with some evidence; explain in terms of the rotation of the Earth why shadows change and the Sun appears to move across the sky during the course of the day; recognise that it is daylight in the part of the Earth facing the Sun, that the Moon orbits the Earth and identify patterns in secondary data about sunrise and sunset

some children will not have made so much progress and will:

recognise that the Earth, Sun and Moon are spherical and describe how shadows change as the Sun appears to move across the sky

some children will have progressed further and will also:

explain that the changes in the appearance of the Moon over a period of 28 days arise from the Moon orbiting the Earth once every 28 days; independently represent times of sunrise and sunset in graphs

LEARNING OBJECTIVES

POSSIBLE TEACHING ACTIVITIES

LEARNING OUTCOMES

POINTS TO NOTE

Find out what children know about the Earth, Sun and Moon by asking them to draw and explain a picture showing how these would look to a traveller in space. Ask children questions about their drawings eg
 – *Is the Earth flat?*
 – *Is the Sun bigger than the Moon?*
 – *Does the Sun move?*

Teachers will need to take account of what this introductory work shows about children's knowledge and understanding of the Earth, Sun and Moon in their short-term planning.
 This unit may be best taught in the winter months when children can look at the direction of the shadows soon after the Sun has risen and just before it sets.

CHILDREN SHOULD LEARN

- that the Sun, Earth and Moon are approximately spherical
- that it is sometimes difficult to collect evidence to test scientific ideas and that evidence may be indirect

◆ Following discussion, use secondary sources and models eg *video, CD-ROM, globe, photographs of the Earth, Sun and Moon taken from space* and ask children whether these suggest the bodies are flat or spherical. Point out to children that it is only in the last 40 years that we have photographic evidence from space about the Earth being spherical and ask them to find out some earlier ideas about whether the Earth was flat or spherical and what evidence people used to support their ideas.

CHILDREN

- recognise that the Earth, Sun and Moon are spheres
- describe some indirect evidence that the Earth is spherical eg *ships sailing round the world, ships appearing and disappearing over the horizon*

- about the relative sizes of the Sun, Moon and Earth

◆ Remind children of the pictures they drew earlier and the photographs they saw and ask them to put Earth, Moon and Sun in order of size by selecting from a range of spheres eg *football, beachball, tennis ball, pea, ball bearing, peppercorn, tiny beads about ¼ size of pea, table tennis ball*. Explain to children that if a pea represents the Earth then the beach ball represents the Sun and the bead the Moon. Ask three children to hold the three spheres and position them in the classroom to give an idea of their relative distances apart.

- select three spheres to represent the Earth, Sun and Moon recognising which is largest and which is smallest and making a reasonable match to relative size

In discussing the relative sizes of the Sun and Moon, it may be helpful to point out that an aeroplane on the ground nearby looks much bigger than an aeroplane in the sky and how this helps to account for the apparent similarity in size of the Sun and the Moon.

- that the Sun appears to move across the sky over the course of a day
- that evidence may be interpreted in more than one way

◆ Ask children about where the Sun shines into the school (or their homes) at different times of day. Remind them of earlier work on shadows and ask them to suggest what this evidence shows. If necessary observe the length and position of the shadow of a stick set up in the playground at different times of day over successive days.

- describe how the apparent position of the Sun changes over the course of a day and clarify that this does not mean that the Sun is moving

 **SAFETY** – warn children NEVER to look directly at the Sun. Blindness can result. See 'Be Safe' section 13.

- that it is the Earth that moves, not the Sun, and the Earth spins on its axis once every 24 hours
- that it is daytime in the part of the Earth facing the Sun and night-time in the part of the Earth away from the Sun

◆ Use secondary sources eg *video, CD-ROM* to illustrate the Earth spinning on its axis. Show children a model of the process eg *using a globe and a strong light source to represent the Sun*. Ask children to show others eg *by modelling or using themselves as Sun and Earth or by drawing or using other models* how night and day arise from the Earth spinning on its axis. Talk with children about the different representations.

- illustrate eg *using models or drawings* that different parts of the Earth face the Sun during the course of the day and where it is day and night
- explain that the apparent movement of the Sun is a result of the Earth rotating or spinning

It is helpful to point out to children that when they are travelling by car or train, houses seem to move. Some children may have had the experience of thinking they were moving when a train travelling in the opposite direction started to move but they stayed stationary.

It is possible to fix a small object to the globe and demonstrate how the shadow changes as the globe rotates and the light source remains still.

- that the Sun rises in the general direction of the East and sets in the general direction of the West
- to make observations of where the Sun rises and sets and to recognise the patterns in these
- to present times of sunrise and sunset in a graph and to recognise trends and patterns in the data

◆ Ask children to use a compass to observe and record, on several days in the winter, the direction of the Sun or of shadows from the Sun when it has just risen and just before it sets. Provide children with secondary data about times of sunrise and sunset and help them to present this data as a graph and to identify patterns in the data. Discuss with children whether it is dark or light when they get up in the winter and summer and what sorts of activities they can do on winter and summer evenings.

- generalise that the Sun rises in the East and sets in the West
- draw simple graphs and identify patterns eg *sunrise gets earlier and earlier up to June and then it starts getting later; when sunrise gets earlier, sunset gets later so it is daylight longer*

Times of sunrise and sunset throughout the year can be found in diaries, newspapers and HMSO publications. It may be helpful to simplify this data before presenting it to children.

LEARNING OBJECTIVES

CHILDREN SHOULD LEARN

- that the Earth takes a year to make one complete orbit of the Sun, spinning as it goes
- that it is not always easy to gain information about phenomena eg *the length of a year* using first-hand experience

- that the Moon takes approximately 28 days to orbit the Earth
- that the different appearance of the Moon over 28 days provides evidence for a 28-day cycle

POSSIBLE TEACHING ACTIVITIES

- ◆ Ask children to use secondary sources eg *CD-ROM, reference books* to find out what a 'year' is. Discuss with children their understanding of a 'year' eg *from birthday to birthday, through all the seasons*. Model the Earth's orbit of the Sun eg *a child moving round a central 'Sun' ie either a lamp or a large group of children, rotating at the same time*.

- ◆ Use secondary sources eg *video, CD-ROM, reference books* to illustrate that the appearance of the Moon changes in a regular manner over a period of approximately 28 days. Model the Moon's orbit round the Earth eg *by asking a child to walk round a group of children representing the Earth so that the child representing the Moon always faces the Earth*. Ask children to describe the movement of the Moon eg *as it goes round the Earth it turns so that the same side always faces the Earth*.

Review work done on the Earth, Moon and Sun by asking children to devise questions for a quiz (together with the answers). Ask children to pose questions to each other and help them to judge the appropriateness of the answers.

LEARNING OUTCOMES

CHILDREN

- state that a year is the time taken for the Earth to make one complete orbit of the Sun showing that they know this from secondary sources eg *reference books, CD-ROMs, information provided by the teacher*

- explain that the pattern and time-scale of the changes in the Moon's appearance over 28 days is evidence that the Moon orbits the Earth once every 28 days

POINTS TO NOTE

The relationship of the seasons to the tilt of the Earth is not a requirement of the programme of study for Key Stage 2. Teachers will need to decide whether it is appropriate to discuss this with some children.

Children do not always understand that the Moon revolves on its axis as it orbits the Earth so that the same side of the Moon always faces the Earth.

Children should be encouraged to look at the Moon both at night and during the day. At this stage they are not expected to recall or explain the appearance of the Moon at different stages of its cycle.

At this stage it is not necessary to discuss different ways of measuring the length of the Moon's cycle. Some children, however, may be aware of some of these differences.



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