



**Science**

**Year: 5**

**Term 3** (Forces topic must be taught before this unit)

**Topic Title: Earth and Space**

**Key Question: How does our planet move around our solar system?**

**National Curriculum Objectives:**

- Describe the movement of the Earth, and other planets, relative to the Sun in the solar system.
- Describe the movement of the Moon relative to the Earth.
- Describe the Sun, Earth and Moon as approximately spherical bodies.
- Use the idea of Earth's rotation to explain day and night and the apparent movement of the Sun across the sky

**Vocabulary:**

Earth, Sun, Moon, (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune), spherical, solar system, rotates, axis, star, orbit, planets, celestial, lunar, eclipse, satellite.

**National Curriculum requirement:** Pupils should read and spell scientific vocabulary correctly and with confidence, using their growing word reading and spelling knowledge.

**Prior Learning:**

Observe changes across four seasons. (Y1 - Seasonal change)

Observe and describe weather associated with the seasons and how day length varies. (Y1 - Seasonal changes)

Recognise that light from the sun can be dangerous (Y3)

(Investigating shadows) Recognise that shadows are formed when the light from a light source is blocked by an opaque object. (Y3)

**Common misconceptions:**

- the Earth is flat
- the Sun is a planet
- the Sun rotates around the Earth
- the Sun moves across the sky during the day
- the Sun rises in the morning and sets in the evening
- the Moon appears only at night
- night is caused by the Moon getting in the way of the Sun or the Sun moving further away from the Earth

**Knowledge:** The Sun is a star. It is at the centre of our solar system. There are 8 planets (can choose to name them, but not essential). These travel around the Sun in fixed orbits. Earth takes  $365\frac{1}{4}$  days to complete its orbit around the Sun. The Earth rotates (spins) on its axis every 24 hours. As Earth rotates half faces the Sun (day) and half is facing away from the Sun (night). As the Earth rotates, the Sun appears to move across the sky. The Moon orbits the Earth. It takes about 28 days to complete its orbit.

The Sun, Earth and Moon are approximately spherical.

**Investigative skills**

Fair/comparative testing	Identifying and classifying	Observations over time	Pattern seeking	Research
<p>How do our shadows change throughout the day?</p> <p>Chn decide how to record and present evidence. They record observations e.g. annotated photographs, labelled diagrams, observational drawings/diagrams or writing. They record measurements e.g. using tables, bar charts, line graphs or scatter graphs.</p>	<p>How could you organise all the objects in the solar system into groups?</p> <p>Can you identify all the phases in the cycle of the Moon?</p>	<p>What does our solar system look like?</p> <p>Chn select measuring equipment to give the most precise results e.g. tape measure or trundle wheel (suitable scale.)</p> <p>How do our shadows change throughout the day?</p> <p>Can you observe all the phases in the cycle of the Moon?</p> <p>(Moon diary homework)</p> <p>In conclusions, chn: identify causal relationships/ patterns in the natural world from their evidence; identify results that do not fit the overall pattern; and explain findings using their subject knowledge.</p>	<p>Is there a relationship between the length of our shadow and the time of day?</p> <p>Chn present the same data in different ways in order to help with answering a question.</p> <p>Is there a pattern between the size of a planet and the time it takes to travel around the Sun?</p>	<p>How have our ideas about the solar system changed over time?</p> <p>How does the length of daylight hours change in each season?</p> <p>Who was Neil Armstrong and what was his achievement? communicate their findings to an audience using relevant scientific language and illustrations.</p> <p>What research is done in space? (Plus chn's individual "wonders" for independent research.</p>

<p><b>Significant Scientists:</b>  <b>Claudius Ptolemy and Nicolaus Copernicus-</b> (Heliocentric vs Geocentric Universe)   <b>Neil Armstrong-</b> First man on the Moon.   <b>Helen Sharman-</b> First British astronaut/woman to visit MIR space station   <b>Tim Peake-</b> First British ESA astronaut to walk in space.</p>	<p><b>End point:</b>  Show, using diagrams, the movement of the Earth and Moon  Explain the movement of the Earth and Moon  Show using diagrams the rotation of the Earth and how this causes day and night  Explain what causes day and night  Can use the model to explain how the Earth moves in relation to the Sun and the Moon moves in relation to the Earth  Demonstrate and explain verbally how day and night occur  Explain evidence gathered about the position of shadows in term of the movement of the Earth and show using a model.  Can explain how a sundial works.  Can explain verbally, using a model, why we have time zones.  Can describe the arguments and evidence used by scientists in the past.</p>
<p><b>Science stories:</b>   <b>Hidden Figures: The True Story of Four Black Women and the Space Race-</b> Margot Lee Shetterly   <b>This rock; that rock- poems between you, me and the moon-</b> Dom Conlon and Viviane Schwarz</p>	<p><b>Oracy:</b>  Odd one out discussion  Video explanations of night and day  Earth and Space taboo (explain the concept without using the displayed words)</p>
<p><b>Cross Curricular Links:</b>  <b>English:</b> Write a balanced argument for and against the idea of the Earth being flat. Communicate findings through oral or written explanations using relevant scientific language and illustrations. Mnemonics and acrostic poetry. Research and write up answers to "wonders" through written presentations.  <b>Maths:</b> construct and interpret tables, charts and graphs to explore data relationships and spot patterns. Scale models. Use a range of scales to measure size and distance.  <b>Music:</b> Sing the planet song/ we are the planets.</p>	
<p><b>Wider Reading and resources</b></p>	<p><b>Enrichment/Science capital</b></p>
<p><a href="http://www.esa.int/kids/en/learn-">http://www.esa.int/kids/en/learn-</a> Great for the children to look at and research from!  <a href="#">STEM Earth and space collection of resources</a>  European Universe Awareness -8 myths collection (resources)  <a href="#">National Schools' Observatory</a>  <a href="#">Met Office:</a> Seasons, solstice and equinox information</p>	<p><a href="#">Royal observatory Greenwich/</a> trip to planetarium  Science space-themed assembly / visitors in school  Length of day in relation to specific professions/extra curricular activities and walking home safely.  Moon diaries  <a href="#">Tim Peake enrichment challenges</a>  What would pupils choose to take with them to space? why?</p>

<b>Sequence of Learning</b>		
Lesson	Key Question	Key learning/notes
1	What does our solar system look like?	<ul style="list-style-type: none"> <li>• <a href="#">Show this Earth and Space compilation clip</a> before chn Complete pre-unit quiz and Science topic KWL page. Create a "wonder" wall of topic questions from the children to explore through the unit.</li> <li>• Show Explorify odd one out activity- <a href="#">maps of the solar system</a>. ask everyone to come up with as many similarities and differences as they can. Think about: appearance, what they do, where they might be found.</li> <li>• Find out about Copernicus and Galileo's theory of a heliocentric solar system. Show current understanding of our <a href="#">solar system</a> (resources.)</li> <li>• What is the shape of the Earth, Moon and Sun? (Approximately spherical, not exactly!) Use secondary sources to examine satellite images of the earth, moon and sun to show their approximately spherical bodies and their curves.</li> <li>• Where are is the Earth, Moon and Sun located in our solar system? Complete the <a href="#">STEM fruit solar system</a> activity (overview resources) to explore the order and scaled size of planets in our solar system.</li> <li>• Sing one these songs to reinforce <a href="#">the planet song</a> or <a href="#">we are the planets</a></li> <li>• Children create drawn scale models of each and use equipment e.g. a trundle wheel to measure scaled distances between them.</li> </ul>

		<ul style="list-style-type: none"> <li>• <b>Ext:</b> Identify and classify: How could you organise all the objects in the solar system into groups?</li> <li>• Chn <i>could</i> plan and write a balanced argument or debate considering evidence for and against the idea that the Earth is flat.</li> <li>• <b>Homework task:</b> research astronomical facts to make a fact file on the Earth, Moon and Sun. can children write mnemonics or acrostic poems to record some key facts? (see overview resources for more suggested activities and research.)</li> </ul>
2	<p>What makes the sun appear to move across the sky?</p> <p>Set up this enquiry in a morning session to observe over the course of a day.</p> <p><b>Investigation:</b> (Observation over time) How do our shadows change throughout the day?</p>	<ul style="list-style-type: none"> <li>• Use the <a href="#">light and time clip</a> on Explorify Have the class seen sundials before? Do they know how sundials help us tell the time? Why do we no longer use sundials as our main method of time keeping? Similarities/differences between modern watches and sundials?</li> <li>• (Recap and build on Y3 light and bridge knowledge ready for Yr 6 light topic) Why do we have shadows? A shadow appears when an object blocks a light source such as the Sun. Do you have a shadow in the classroom? Why? Yes, anywhere there is a source of light, you will cast a shadow. If you are standing outside and the Sun is behind you, where will your shadow be? In front of you. Shadows always point away from the source of light which causes them. Reinforce this last point.</li> <li>• Carry out the Royal Observatory human sundial activity (Full investigation write up- templates and example graph provided in the resource however you may wish to adapt.) What do you think will happen to your shadow at different times of the day? Children write <b>predictions</b> in books then investigate movement and length of shadows during a sunny day through the context of a sundial.</li> <li>• Draw a line graph or bar chart below showing the length of your shadow at different times of the day. What happened to your shadow?</li> <li>• Stick tables and graphs into books. Chn make observation notes under "<b>I see, I notice, I wonder</b>" by reflecting on the investigation plus what they can see from the results. They answer further questions underneath to find patterns and explain the data. When is the Sun highest in the sky? What happened to your shadow at this time?</li> <li>• (Write formal conclusions using <b>SNW</b> notes after the next lesson to assess understanding of the investigation in relation to changes throughout the year.)</li> </ul>
3	<p>Why do we have day and night?</p> <p>(Set moon diary homework this week so that it can be completed before the end of the unit)</p>	<ul style="list-style-type: none"> <li>• Use Explorify <a href="#">What's going on- Earth activity</a> (Y5 activities Earth and Space) to show the transition of night to day. What is going on? Do pupils know they're looking at the Earth from space? Can they see any countries they can identify? What's changing in the video as the Earth is rotating? What other celestial bodies can they see?</li> <li>• Watch BBC bitesize <a href="#">how do we get day and night?</a> to explore why day and night occur on Earth and why day length changes throughout the year. Who might this knowledge be helpful for? (People who work outdoors: farmers, gardeners; leaders of extra-curricular clubs/activities; planning safest time of year to start walking home from school etc.)</li> <li>• Now having more background information, Chn to write formal conclusions to their enquiry from last lesson using the SNW notes and appropriate sentence stems, scaffolds and word banks to include key scientific language.</li> <li>• Once finished, chn recreate the explanation on the BBC clip using torches and PE balls (or even better if you have small globes!) in threes- Display key words Earth, rotate, axis, Sun, lighter, darker, day, night and length for children to use in verbal explanations. Ensure chn know that the Earth rotates anti-clockwise on its axis. It takes 24 hours for the Earth to complete one full rotation (they obviously will be showing us a sped-up demonstration for their Science but they should still tell us these key points!)</li> <li>• Take videos of the children presenting their explanations. Extend by asking chn to rotate their model to indicate where Earth would be in relation to the sun at specific times of day. You could briefly touch on how the Earth's tilt on its axis creates seasons (KS3).</li> <li>• Present chn with pre-collected data about the length of the days across the year. Chn graph changes in the day length during the year and answer Maths comprehension questions to interpret the data &amp; explore cause and effect.</li> </ul>
4	<p>What are the phases of the moon?</p>	<ul style="list-style-type: none"> <li>• The Sun's a million times larger in volume than the Earth so how can its rays be obscured by the much smaller Earth and Moon? Watch the <a href="#">video</a> about moon phases and eclipses. Children and find out why it appears to change shape in the</li> </ul>

		<p>night sky. Another useful clip is from the <a href="#">BBC stargazing series</a>.</p> <ul style="list-style-type: none"> <li>• Ensure children understand that the moon is not a light source but a reflector. (demonstrate with a ball covered in foil in a dark area so that chn can see that it does not shine then direct a lit torch towards it to present the sun and observe that the light is reflected off its surface and so it appears to shine.</li> <li>• Look at the lunar cycle in more detail using the Twinkl ppt (overview resources) and use the correct terminology. Children to draw and label a diagram of the moon phases.</li> <li>• Discuss chn's homework Moon diaries- have they been making close and careful observations? What have they noticed so far? Encourage them to continue with it until the end of the unit. Have they seen any of the particular phases? How do they know? Provide them with a moon phases wheel to take home and engage further with their diaries.</li> <li>• As a class, research the life of <a href="#">Neil Armstrong</a> and find out about the <a href="#">first men to walk on the Moon</a>. Video- <a href="#">Apollo 11- the first moon walk</a> (clip in resources)</li> <li>• Children to add any new knowledge/interesting facts to their KWL page.</li> <li>• What if there was no moon? Encourage children to think about the effect on nature and indeed the stability of planet Earth! Chn learn that the moon is responsible for the tide and also that some animals use it for navigation.</li> </ul>
5	What research is done in space?	<ul style="list-style-type: none"> <li>• Tim Peake describes that the <a href="#">International Space Station</a> is a working laboratory, where a number of international astronauts undertake a variety of different scientific experiments and research. It is located 400km above the Earth and it travels at 17500 miles per hour. This results in it orbiting the Earth every 90 minutes, and this means that the astronauts see 16 sunrises and sunsets every day! <a href="#">Find out more about the international space station</a>.</li> <li>• Chn may complete a range of investigations relating to Earth and Space. Use the Tim Peake project materials (overview resources) to investigate moon craters, egg launching, speed rockets etc. Photos for WS folder with scribed comments/post its from children- this does not need to be a formal write up.</li> <li>• Chn may also use this lesson to research something from their wonders, including any new questions they may have about the ISS and decide how they would like to present this information.</li> <li>• Complete out of this world <a href="#">mystery bag activity</a> from Explorify. Thinking about the items that astronauts took into space, explore what would your pupils choose to take with them and why? (Remind them that the astronauts will be away from families and friends for anything from six to nine months)</li> </ul>
6	How does our planet move around our solar system?	<ul style="list-style-type: none"> <li>• Complete the Earth and Space <a href="#">playground treasure hunt activity</a> (resources)</li> <li>• Children to complete the end of unit quiz and add to their KWL</li> <li>• As a class return to any of the wonders that children had throughout the unit. Can we answer any now? What new wonders do the children have?</li> <li>• Play Earth and Space taboo to explore and embed vocabulary and understanding.</li> </ul>