

# Space (ages 4-11)

## Explorify planning support



Curriculum statements	Explorify activities	Suggested use / taking it further
<b>CELEBRATING SCIENTISTS</b>		
<p>Through research and discussion I have an appreciation of the contribution that individuals are making to scientific discovery and invention and the impact this has made on society.</p> <p><i>Scotland</i></p> <p>I can describe the impacts of science and technology, past and present, in my everyday life.</p> <p><i>Wales</i></p>	<p><a href="#">Who is... Maggie Aderin-Pocock</a></p> <p><b>WHO</b></p>	<p>Children of all ages may recognise Maggie Aderin-Pocock from her work on CBBC but this activity delves deeper into her career. You may want to carry out a stargazing event in school or ask the children to stargaze at home then use this fantastic <a href="#">guide</a> to give you some useful tips.</p>
	<p><a href="#">Who is... Katherine Johnson?</a></p> <p><b>WHO</b></p>	<p>A great starter if you want to cover space exploration history and link to current space exploration. For example, Samantha Cristoforetti is currently commander of the ISS - the first European woman to take on this role.</p> <p>Find out more about the life and work of Katherine Johnson. Watch this <a href="#">film</a> to find out more about her. This is a clip from the film <a href="#">Hidden Figures</a> showing Katherine Johnson, played by an actress, calculating the flight path of the spacecraft. Alternatively, watch this <a href="#">film</a> from NASA on the current Artemis mission which aims to land the first woman and a person of colour on the Moon. Through the mission, scientists hope to learn more about how humans can live in space. Simple recording could be: <i>explain how Katherine Johnson's work makes you feel about maths</i> (using less than 25 words and more than 10) or children could write a letter applying to be one of the astronauts that will travel to the Moon on Artemis or write a diary imagining they were one of the astronauts just landing on the Moon.</p>

	<p><a href="#">Space engineer</a></p>	<p><b>WHO</b> Maggie Aderin-Pocock talks about her career and background. This could inspire children to find out what satellites are used for:</p> <ul style="list-style-type: none"> <li>• taking pictures of the Sun, Earth, and other planets</li> <li>• looking deep into space at black holes, distant stars and galaxies</li> <li>• tracking atmospheric movement to help predict the weather</li> <li>• looking for evidence of climate change or deforestation</li> <li>• beaming TV signals and phone calls around the world providing our Global Positioning System (GPS) which helps us use 'satnav'</li> </ul>
	<p><a href="#">What if you worked at NASA but weren't an astronaut?</a></p>	<p><b>WI</b> It takes a lot of people to run a space agency, more than 18,000 people work for NASA alone. A lot of them are scientists and engineers. Other roles are lawyers, accountants, teachers, cleaners, therapists and personal trainers. When President John F. Kennedy visited the NASA Space Centre in 1962, he noticed a caretaker carrying a broom. The President went over to the caretaker and said "Hi, I'm Jack Kennedy, what are you doing?" The caretaker replied: "Well, Mr President. I'm helping put a man on the moon." Your children could write applications to space agencies (not for an astronaut) explaining why they want the job and what skills they have. Check out this <a href="#">careers page</a> on the NASA website.</p>
<p>Book recommendation: <a href="#">Hidden Figures</a> by Margot Lee Shetterly.</p>		

## SPACE EXPLORATION, TECHNOLOGY AND ENRICHMENT

<p><b>I have experienced the wonder of looking at the vastness of the sky, and can recognise the sun, moon and stars and link them to daily patterns of life.</b> <i>Scotland</i></p>	<p><a href="#">What would you investigate in the ISS?</a> <b>TBQ</b></p>	<p>Learn that the International Space Station (ISS) is an orbiting laboratory on which hundreds of experiments have been conducted. Astronauts (or Cosmonauts if trained by the Russian Space Agency) live on board the ISS and conduct the experiments. The experiments help us learn more about living and working in space but also help us with things back on Earth. Cancer research is one of the many things happening on board but during Tim Peake's mission, the <a href="#">Royal Horticultural Society sent rocket seeds</a> to space for schools to investigate if the effects of being in space would affect how rocket seeds germinated and grew back on earth.</p>
<p><b>I can talk about science stories to develop my understanding of science and the world around me.</b> <i>Scotland</i></p>	<p><a href="#">Far, far away</a> <b>ZIZO</b></p>	<p>This image was taken by the <a href="#">James Webb Space Telescope (JWST)</a> and shows the Southern Ring nebula, a dying star with a foamy edge of escaping gas. Children can learn all about how the largest, most powerful telescope ever built was launched into space in December 2021.</p>
<p><b>I have contributed to discussions of current scientific news items to help develop my awareness of science</b> <i>Scotland</i></p>	<p><a href="#">Prepare for launch</a> <b>LWCYH</b></p>	<p>Listen to a NASA Space Shuttle launching at Cape Canaveral, Florida.</p>
<p><b>I can report and comment on current scientific news items to develop my knowledge and understanding of topical science.</b> <i>Scotland</i></p>	<p><a href="#">To the Moon and beyond</a> <b>WGO</b></p>	<p>This shows the launch of Artemis 1, NASA and ESA's new planned missions to the Moon.</p>
<p><b>I can report and comment on current scientific news items to develop my knowledge and understanding of topical science.</b> <i>Scotland</i></p>	<p><a href="#">Out of this world</a> <b>MB</b></p>	<p>Each of the items in our list has been taken to the International Space Station by astronauts. Some personal items taken to the ISS are commemorative items that show the path the astronaut took to achieve their goal; others are purely for enjoyment.</p>
<p><b>I can report and comment on current scientific news items to develop my knowledge and understanding of topical science.</b> <i>Scotland</i></p>	<p><a href="#">Habitat extremes</a> <b>MS</b></p>	<p>Scientists are looking to see if they can find signs of life on Mars, one of the most extreme environments imaginable. After designing an extreme habitat, children can design a creature who could survive there. Revisits the idea of living things being adapted to their environment.</p>
	<p><a href="#">Crewed mission to Mars</a> <b>MS</b></p>	<p>This is a challenge for your children to design a module or Crew Exploration Vehicle that would allow humans to land on Mars. This is a special craft designed to protect the crew inside. It needs to be able to land upright and have shock absorbers to protect the crew from the impact as it lands on the planet's surface. Children could</p>

<p><b>I can describe the impacts of science and technology, past and present, in my everyday life.</b> <i>Wales</i></p> <p><b>Interdependence: Technology challenges of living in Space, for example, how to survive in Space.</b></p> <p><b>Movement and Energy: How forces can affect the movement and distance objects can travel, for example, the benefits of wearing a seatbelt or rockets.</b></p> <p><b>How knowledge in science supports technological inventions, for example, robots in Space.</b> <i>Northern Ireland</i></p>	<a href="#">Soft landing</a>	WGO	test their creations by putting it in an egg inside as an 'eggtronaut' and revise their knowledge of forces. The film shows the Martian parachute design being tested on Earth.
	<a href="#">Measuring Marsquakes</a>	PS	Just like Earthquakes, Marsquakes send out shockwaves that travel through the ground. Challenge your children to design and make a seismometer machine to measure the size of the Marsquakes. Links to children's knowledge of forces.
	<a href="#">Manoeuvring on the Moon</a>	WGO	The video shows a family of five multi-purpose U-shaped rovers designed to carry science instruments. A good starter activity if you are doing Resilient rovers.
	<a href="#">Resilient rovers</a>	PS	Inspire your children with the WGO film showing a Mars rover being tested over rocky terrain, then challenge them with a problem-solving activity. Build your own space rover for the Moon using KEX kits, Lego kits and toy cars/vehicles to add to, mixed materials (bubble wrap, sandpaper, foam, corrugated card, paper, drawing pins, fabrics, foil etc), scissors, tape. There is additional <a href="#">guidance</a> here (activity 4, p20) for making a simple space rover.
	<a href="#">Flexible wheel</a>	WGO	
	<a href="#">Who should own space?</a>	TBQ	In the 1960s the 'Outer Space Treaty' was signed by America and Russia to say that the Moon and other space objects belonged to all of humankind and that exploration must be peaceful. You could discuss and debate this idea and research more about the 'Space Race' with this <a href="#">timeline</a> or this <a href="#">NASA link</a> .
	<a href="#">Awesome observing</a>	OOO	This would be a good discussion prompt if you are learning about ancient astronomy. The three images are Stonehenge in Wiltshire, UK (believed to have been built around 5,000 years ago), El Caracol which is a Mayan observatory at Chichen Itza, Mexico (built around 600 AD) and the Kielder Observatory in Northumberland, UK (built 2008).
	<a href="#">Fit for an astronaut</a>	TBQ	You could think about the big question and then give children a chance to design a space suit with this problem-solving activity. Children could even take part in this <a href="#">global experiment</a> with different materials to discover which blocks UV light the best. This link to the <a href="#">Principia Space Diary website</a> provides further video and worksheet resources.
<a href="#">Suits you</a>	PS		

	<a href="#">Could we use the sun to help find our way on Mars?</a>	<b>TBQ</b>	Mars does not have a magnetic field around it, so a compass will not work on Mars. This activity how you can find your way using the Sun's position. For example, shadows are shortest when the sun is exactly south.
	<a href="#">Looking at you</a>	<b>ZIZO</b>	Zoom in on the helmet of a space suit, then zoom out to see an astronaut on a space walk, outside the International Space Station. Follow up by making your own cardboard 'pretend' telescope or turning your kitchen area into a space control centre.
	<a href="#">Cleaning in space</a>	<b>WGO</b>	Watch Tim Peake carrying out cleaning duties on the International Space Station.

## SPHERICAL CELESTIAL BODIES – THE EARTH, SUN, MOON AND PLANETS

<p><b>Describe the Sun, Earth and Moon as approximately spherical bodies</b> <i>England</i></p> <p><b>Place: What is in our world? Where is it in the universe?</b> <i>Northern Ireland</i></p>	<p><a href="#">Goldilocks planets</a></p> <p>(or <a href="#">Celestial objects</a> see below)</p>	<p><b>OOO</b></p> <p><b>OOO</b></p>	<p>Contrast three of our solar system's planets: Earth, Venus and Saturn. This could lead to a discussion about why Earth is the only planet known to have life, making a comparison of <a href="#">temperatures on different planets</a>. This <a href="#">BBC video</a> introduces the Earth.</p> <p>Children enjoy 'recreating' the solar system on the playground with individual children representing the different planets by holding balls (or inflatable planets) but this, of course, is not to scale...</p> <p>The <a href="#">Glasgow Science Centre</a> has a video to introduce the planets of the solar system and models them. It goes on to explain two scaled models- one compares the relative sizes of the planets (this can also be done using <a href="#">fruit</a> or <a href="#">playdough</a>) and the other compares the distances between them (this <a href="#">Ogden Trust resource</a> is useful or this <a href="#">'toilet roll' model</a>).</p> <p>Here is another useful videos about <a href="#">scale</a>.</p>
	<p><a href="#">How many stars can we see?</a></p>	<b>TBQ</b>	<p>Children need to know that our Sun is a star and that stars are all suns that are a long way away. You may want to carry out a stargazing event in school or ask the children to stargaze at home then use this fantastic <a href="#">guide</a> to give you some useful tips.</p>
	<p>Book recommendation: <a href="#">Here we are</a> by Oliver Jeffers</p>		

## PLANETS OF THE SOLAR SYSTEM ORBIT THE SUN

<p><b>Describe the movement of the Earth, and other planets, relative to the Sun in the solar system</b></p> <p><b>Identify the scientific evidence that has been used to support or refute different ideas about the solar system.</b> <i>England</i></p> <p><b>By safely observing and recording the sun and moon at various times, I can describe their patterns of movement and changes over time. I can relate these to the length of a day, a month and a year.</b> <i>Scotland</i></p>	<p><a href="#">Maps of the solar system</a>      ○○○</p>	<p>Children can learn that scientists changed their ideas about the solar system as they gathered more evidence. Astronomers such as Nicolaus Copernicus, Galileo Galilei, Johannes Kepler and Isaac Newton helped develop the heliocentric system (with the sun at the centre) rather than the geocentric one (with the planets orbiting a stationary earth).</p> <p>Children enjoy ‘recreating’ the solar system on the playground with individual children representing the different planets by holding balls (or inflatable planets).</p> <p>With balls on strings, children can find the pattern between the length of the string and the time taken to orbit ten times. Ogden Trust have support for <a href="#">pattern seeking investigations</a>.</p> <p>These <a href="#">Ogden Trust research cards</a> identify six key people and projects that made contributions to how our ideas about the Earth and space have changed over time and can be used to help students understand how scientific ideas are developed. Children could work in 3s being the interviewer, expert and checker and record their explanations.</p>
<p><b>By observing and researching features of our solar system, I can use simple models to communicate my understanding of size, scale, time and relative motion within it.</b> <i>Scotland</i></p>	<p><a href="#">Celestial objects</a>      ○○○</p>	<p>Three images of spherical bodies in space: the Earth, the Sun, and the Moon. They all appear to be a similar size in the photos, but, of course, they aren’t. One is a star, one is a planet, and one is a natural satellite.</p>
	<p><a href="#">The great red spot</a>      ZIZO</p>	<p>Jupiter is the largest planet, a gas giant, in our solar system. This could be used to engage children before a research and report writing task on planets in the solar system.</p>
	<p><a href="#">It’s a shady business</a>      ○○○</p>	<p>Compare photographs of Mars, the Moon during a total lunar eclipse and a whirlwind on the surface of Mars. This could be used to engage children before a research and report writing task on planets in the solar system. This video with <a href="#">ESA’s Paxi</a> explains the phases of the Moon and eclipses.</p>



<b>Place: What is in our world? Where is it in the universe?</b> <i>Northern Ireland</i>	<a href="#">Far, far away</a>	<b>ZIZO</b> Focus in on another galaxy, turned on its side, and viewed through the James Webb Space Telescope. Consider the life cycle of a star and follow up by making origami telescopes.
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## THE MOON ORBITS EARTH

<b>Describe the movement of the Moon relative to the Earth.</b> <i>England</i>  <b>By safely observing and recording the sun and moon at various times, I can describe their patterns of movement and changes over time. I can relate these to the length of a day, a month and a year.</b> <i>Scotland</i>  <b>Place: What is in our world? Where is it in the universe?</b> <i>Northern Ireland</i>	<a href="#">Have you ever looked at the Moon and noticed how it appears to be different shapes at different times?</a>	<b>HYE</b> This would be a brilliant starter activity to introduce the Moon and find out what children already know. Keeping a <a href="#">Moon diary</a> for a month is a fun piece of home learning that will get children are observing over time. Make sure you are teaching the unit in the winter when it is easier to see the Moon and check whether the Moon will be visible in your area when you set the homework. This <a href="#">BBC bitesize video</a> helps explain why the Moon seems to change its appearance and this <a href="#">one demonstrates a method</a> for demonstrating this in the classroom.  Children really benefit from acting out the movements of the Sun (holding torch), Earth and Moon in groups of 3 (outside or in the hall). The child 'being' Earth needs to carefully spin saying night and day as they face the sun and revolve slowly around the sun. The child 'being' the Moon orbits the Earth and the Sun and so has to move sensibly- can they check that they have orbited Earth 12-13 times on during one revolution of the sun? Each child should have a turn in each position.  These <a href="#">Phase of the Moon</a> resources might be useful and this <a href="#">website</a> compares how we see the Moon with it's position in its orbit day by day. This video with <a href="#">ESA's Paxi</a> explains the phases of the Moon and eclipses. By applying to <a href="#">Borrow the Moon</a> , children can observe pieces of real Moon rock and other interesting space rocks when they visit your school.
	<a href="#">Black hole</a>	<b>ZIZO</b>
	<a href="#">Space objects</a>	<b>OOO</b> Explore the meaning of the word satellite: something (a Moon, planet or object) that orbits a planet or a star. The Moon is a natural satellite of the Earth. This useful video explains why <a href="#">satellites don't fall out of the sky</a> .
	<a href="#">Weight a minute</a>	<b>ZIZO</b> Why do astronauts move differently and weight less on The Moon? This ZIZO could start a conversation or check children's understanding of gravity. They need to know that you always have

		<p>the same amount of mass. However, the greater the mass of an object, the greater its gravitational pull, and vice versa. Your weight is measured by the force of gravity acting on your mass (pulling you down). So if the celestial object you are standing on is smaller than the Earth (e.g., the Moon), the force of gravity acting on you is less, so your weight decreases.</p> <p>Children could compare the mass of objects in grams using a balance with the weight of the object using a force meter. They could find out <a href="#">Your Weight on Other Worlds</a> with this special online calculator. This will reinforce their learning of forces.</p>
<a href="#">Reflections on Mars</a>	<b>ZIZO</b>	<p>Here, we take a close look at the moons of Mars, Phobos and Diemos. Children enjoy researching how many moons each of the planets in our solar system has and creating bar charts to display the information.</p>
<a href="#">What if there was no Moon?</a>	<b>WI</b>	<p>Reflect on the role of the Moon for nocturnal animals, the tides and navigation. Learn that the Moon's size (compared to other moons in the solar system) means its presence has a steadying effect on Earth's rotational angle or tilt, keeping it inclined at around 22 degrees. With no Moon, the Earth would 'wobble', resulting in more dramatic seasons and weather.</p>
<a href="#">Tide and seek</a>	<b>LWCYH</b>	<p>Listen to the sound of the tides as a prompt if you are learning about how we have two high and low tides each 24 hours. The Moon orbits the Earth and it is the gravitational pull of the Moon and Sun which creates tides on Earth, pulling the water in our oceans across the Earth as it rotates. This <a href="#">BBC video</a> explains this idea in a simple way for children and explores how to observe the Moon and its changing phases.</p>
<a href="#">Sandcastle</a>	<b>WGO</b>	<p>Watch the sandcastle erode as the tide, is controlled by the gravitational force of the Moon and also the rotational force of the planet, comes in.</p>



## NIGHT AND DAY

<p><b>Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.</b> <i>England</i></p>	<p><a href="#">Earth</a> <b>WGO</b></p>	<p>This short film (taken from above Earth and speeded up so that you can see the Earth spinning and the sun rising over Europe) can be followed up with this one from <a href="#">BBC Bitesize</a> with a narrated explanation. Children can slowly rotate globes anticlockwise whilst shining a torch to represent the Sun and observe how we experience day and night. Can they find countries who have their day when we have night? Link to geography: identify the position and significance of latitude, longitude, Equator, Northern Hemisphere, Southern Hemisphere, the Tropics of Cancer and Capricorn, Arctic and Antarctic Circle, the Prime/Greenwich Meridian and time zones (including day and night).</p>
<p><b>By safely observing and recording the sun and moon at various times, I can describe their patterns of movement and changes over time. I can relate these to the length of a day, a month and a year.</b> <i>Scotland</i></p>	<p><a href="#">Light and time</a> <b>WGO</b></p>	<p>Children need to link the spin of the Earth causing night and day with the apparent movement of the sun in the sky. A sundial uses the apparent movement of the sun to tell the time. Children could investigate a '<a href="#">human sundial</a>' measuring and plotting the length of their shadows over the course of a day. They can use chalk to record the change in direction too.</p>
<p><b>Place: What is in our world? Where is it in the universe?</b> <i>Northern Ireland</i></p>	<p><a href="#">Can you see the sunrise in space?</a> <b>TBQ</b></p>	<p>Earth spins once in 24 hours and so we experience a sunrise once a day. Meanwhile, the International Space Station (ISS), the habitable satellite research laboratory situated in low Earth orbit, travels at an incredible 17,100 miles per hour, which means it takes 90 minutes to complete one orbit of planet Earth. As a result, the astronauts onboard get to witness an orbital sunrise 16 times each day!</p>
	<p><a href="#">What if there were no clocks?</a> <b>WI</b></p>	<p>This video explains the <a href="#">history of time telling</a>. Link to geography: identify the position and significance of latitude, longitude, Equator, Northern Hemisphere, Southern Hemisphere, the Tropics of Cancer and Capricorn, Arctic and Antarctic Circle, the Prime/Greenwich Meridian and time zones (including day and night)</p>
	<p><a href="#">Have you ever spoken to a friend or relative somewhere else in the world and the time was different?</a> <b>HYE</b></p>	<p>Many children will have experienced time zones through travel, or speaking to family and friends around the globe. Make them the experts and use their experiences to introduce time zones to your class. Check that they understand that Time zones are necessary because the Earth rotates on its axis every 24 hours. When the Earth is facing the Sun, we have daylight and when it is facing away from the Sun, it is dark. They could make videos explaining how we</p>

		have day and night, and why we need time zones, using a bright torch as the Sun and small drawing of themselves and who they speak to stuck on the correct place on a globe, mini-globe or a ball.
<a href="#">What if the sun rotated and the Earth didn't?</a>	<b>WI</b>	The Earth spinning on its axis resulting in night and day is a difficult concept for children to grasp. Revisiting the idea with this conversation starter helps embed children's learning.
<a href="#">What if there was no night?</a>	<b>WI</b>	This would happen if the Earth had a day side, and a night side like Mercury does. A good activity to check children's understanding of the Earth spinning on an axis.
<a href="#">What if the Earth wasn't on an axis?</a>	<b>WI</b>	This is a tricky concept to fully grasp. Children need to make a model of the Earth and Sun to show why we have day and night. They can then use the model to explain what would happen if the Earth did not rotate on its axis. Guidance for this is available in activity 2 'Earth, Sun and Moon orbits' from <a href="#">BBC Stargazing Live!</a>
<a href="#">What if there were two suns?</a>	<b>WI</b>	This activity would be useful to check that children remember that Earth takes a year to orbit the Sun and it is the spin of the Earth on its axis which results in night and day. It might be best used once children have been taught these concepts – revisiting and assessing their understanding. This <a href="#">NASA report</a> explains that there are solar systems with two suns and this <a href="#">simulation</a> helps children visualise how double sun solar systems work. If we had two suns, scientists suggest that the days could be much brighter and warmer when both suns were up. However, the suns might sometimes have different sunrises and sunsets meaning there could be times where just one sun was up. Scientists also suggest that the suns would eclipse (move in front of each other) as often as once a week and that the seasons might change more rapidly. You might like your children to find out more about what would happen to their shadow if there were two suns. You could model this out using a toy figure and two torches!

ABBREVIATIONS AND DESCRIPTIONS OF THE DIFFERENT EXPLORIFY ACTIVITY TYPES		
<b>ZIZO</b>	Zoom In, Zoom Out	Visually engaging close-up photos
<b>OOO</b>	Odd One Out	Find similarities and differences
<b>WGO</b>	What's Going On?	Short, distraction-free videos
<b>HYE</b>	Have You Ever?	Activities linked to everyday experiences
<b>WI</b>	What If?	Explore ideas in new contexts
<b>TBQ</b>	The Big Question	Plan an investigation
<b>PS</b>	Problem Solvers	Think critically and creatively
<b>MS</b>	Mission Survive	Fun, imaginative hands-on challenges
<b>MB</b>	Mystery Bag	Use senses to work out contents in a bag
<b>LWCYH</b>	Listen What Can You Hear?	Recordings of familiar sounds
<b>SWA</b>	Start With Art	Using artworks to prompt science discussion
<b>WJH</b>	What Just Happened?	Observing changes over time
<b>WHO</b>	Who Is?	Learn about a diverse range of scientists

**Other recommended resources to support planning:**

[PLAN primary science assessment resources \(planassessment.com\)](https://planassessment.com)

[Assessment \(TAPS\) - Curriculum Materials | Primary Science Teaching Trust \(pstt.org.uk\)](https://pstt.org.uk)

[The Great Science Share](#) - see videos on Scientific Enquiry under the tab "Great Science Skills".

Explorify is managed by STEM Learning and the Primary Science Teaching Trust



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