Mendell Primary School

Aspire Challenge Achieve

Medium Term Plan Science

Year Group: 5	Term: Spring 2	Teacher: Miss Keenan	Subject lead: Sarah Bride

Common Misconceptions:

Some children may think:

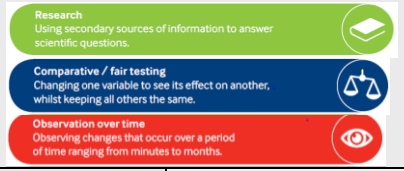
- the Earth is flat
- the Sun is a planet
- the Sun rotates around the Earth
- the Sun moves across the sky during the day
- the Sun rises in the morning and sets in the evening
- the Moon appears only at night
- night is caused by the Moon getting in the way of the Sun or the Sun moving further away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

Unit key Vocabulary:

Earth, Sun, Moon, (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune), spherical, solar system, rotates, star, orbit, planets

Overview: Earth & Space

- **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 the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky.**



Key End Points: By the end of this unit children will be able to:

- Explain the shape and relative sizes of the Earth, Sun and Moon
- Explain why we have day and night
- Explain about the Earth's orbit around the Sun
- To describe the Moon's phases and orbit of the Earth
- Describe the Solar System and human kinds journey into space
- Name the 8 planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune (Pluto reclassified as a 'dwarf planet in 2006)
- To describe the moon as a celestial body that orbits a planet (Earth has one moon; Jupiter has four large moons and numerous smaller ones)

Links to other learning:

Prior Learning:

Observe changes across the four seasons. **(Y1 - Seasonal changes)**

- Observe and describe weather associated with the seasons and how day length varies. **(Y1 - Seasonal changes)**
- Prior knowledge of gravity (**Forces Y5**)

Women in Science Day – Mae Jemison (Astronaut and first Black woman in space)

Future Learning:

Gravity force, weight = mass x gravitational field strength (g), on Earth g=10 N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only). **(KS3)**

- Our Sun as a star, other stars in our galaxy, other galaxies. **(KS3)**
- The seasons and the Earth's tilt, day length at different times of year, in different hemispheres. **(KS3)**
- The light year as a unit of astronomical distance. **(KS3)**

High Quality Text: George's Secret Key To The Universe by Lucy & Stephen Hawking

Scientist to study:

Tim Peake (Astronaut who was the first British person to walk in space)

Valentina Tereshkova (Astronaut and first woman in space)

Mae Jemison (Astronaut and first Black woman in space)

Jeremiah Horrocks – sometimes known as Jeremiah Horrox – he was the first astronomer to demonstrated that the moon moved around the earth. (Local Scientist for History)

Risk Assessment/Healthy and safety

Teacher CPD:

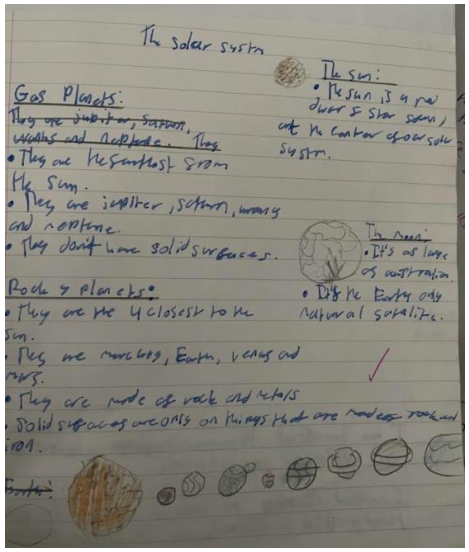
PLAN ASE Isabella/Meliss a Unit of work.

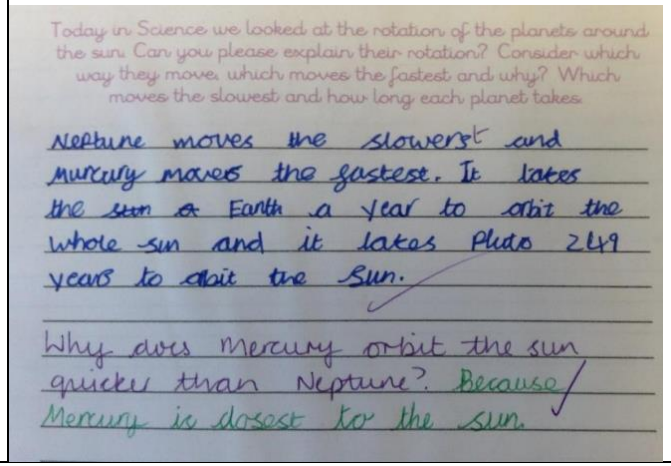
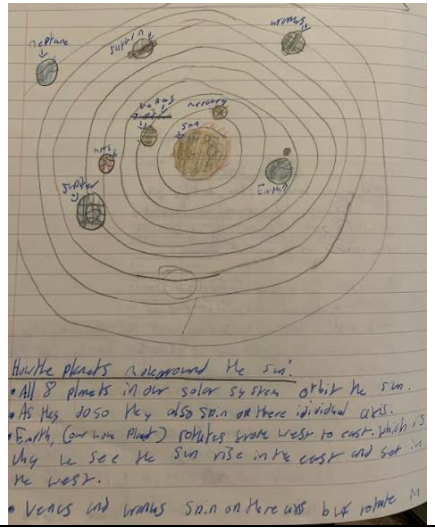
Reach Out CPD - https://www.reachoutcpd.com/ sign up for free.

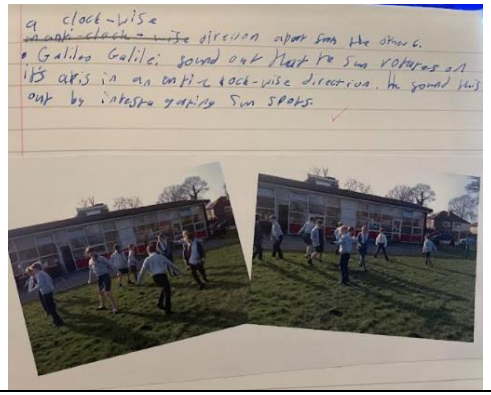
			Nicolaus Copernicus Polish astronomer who created the theory that the Earth and the planets move around the Sun. **Neil Armstrong** (Astronaut who was the first human to walk on the Moon)		

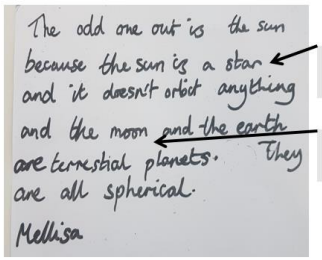
Homework Project: How does the moon change over time? Children create a moon dairy across 28 days to see the moon's phases over time.
Trip to Liverpool Museum and planetarium to be planned with Science Co-ordinator (Week 5) therefore only four lessons to accommodate class trip. Children should make reflections on what they found out from their trip in books.

	Learning Intention	Lesson Outline (Key Questions in colour)	Resources	Vocabulary	Lowest 20% Adaptations
1	L.I. I can research our solar system and human kinds journey into space.	**This is a Science lesson. In Science, we study nature and the behaviour of natural things. The skill we will be using this lesson is asking questions,** **Pre topic assessment:** Ask the children to work in pairs to sort the fact cards about the solar system into true/false/not sure. Encourage talk between the children about what they already know about the topic. Remind them of their prior learning in Year 1 seasonal changes about day length, some may also make links to their work on light and shadows in Year 3 **Big Question: what is the solar system? – What questions do you have about the solar system?** Ask the children what they already know about space and our solar system – children may refer to their English text from Year 3 – Counting on Katherine and work from Women in Science day in February Mae Jemison. Create thought shower in books. Ask the children if they can name any planets in our solar system – some children will be able to name a number of planets. Ask for feedback on anything else they already know about the solar system – add this to Science working wall. Watch https://www.stem.org.uk/resources/elibrary/resource/460433/solar-system to provide children with an understanding of what the solar system is. Ask the children to use secondary resources including books, websites, animations and video clips to find out about our solar system. Facts to research: The names of the planets in our solar system. Other things in our solar system – sun, moon, asteroids etc.. Which planets are Jovian (gaseous) and which are Terrestrial (rocky). The planets in order from the sun. They should also research human kinds journey into space this could include reference to Neil Armstrong, Tim Peake and Mae Jemison.	True/false/not sure cards see example in resources. Ipads, books about space.	**Jovian, terrestrial, Earth, Sun, Moon, (Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune), spherical, solar system, rotates, star, orbit, planets**	

		They can decide how to organise their research including diagrams, bullet points, notes, lists, drawings, mind maps etc… ensure all children draw and label the planets in relation to their distance from the sun. **Can they include facts about the size and shape of the planets?** Online secondary sources of information: planets ← http://nineplanets.org/tour/ http://starchild.gsfc.nasa.gov/docs/StarChild/solar_system_level2/solar_system.html ← http://solarsystem.nasa.gov/planets/ ← http://spaceplace.nasa.gov/menu/solar-system/ ← http://www.amnh.org/explore/ology/astronomy/planetary-mysteries ← http://planetfacts.org/size-of-planets-in-order/ **Example:**  **Word of the Week:** solar system			
2	L.I. I can discuss the work of significant astronomers and explain how the	**This is a Science lesson. In Science, we study nature and the behaviour of natural things. The skill we will be using this lesson is recording data and communicating information.** **Prior learning:** **Can you name the 8 planets?** **What type of plants are Jovian? Terrestrial?** **Word of the week**: orbit	https://www.bbc.com/education/clips/z6shfg8 - *Copernicus and Galileo;* http://www.theplanetstoday.com/ & http://www.sola	**Orbit** **Earth** **Space** **Solar system** **Nicolaus Copernicus, planetary motion,**	

	planets move in space.	**Big Question:** **How do the planets move in space?** **How do you think the planets are organised in space?** Show them the planetary movement link and note that they don't all sit in a long line, but are in different positions in their orbit around the sun. **Do you think that we have always known that the planets move around the sun?** Show them the first BBC clip and explain that Copernicus and Galileo challenged the established 'geocentric' (earth centred) model of the solar system established by Ptolemy in the 2nd Century, to suggest that it was 'heliocentric' (sun centred). At the time of Copernicus and Galileo it was considered 'heresy' to suggest that the Earth was not at the centre, but these scientists suggested that it was in fact the Earth moving on its own axis as well as around the sun which made it appear like the sun and stars were moving - they used their observations and mathematical calculations to back up their ideas, although it took time before even more concrete 'proof' was available (or accepted). Make observations on orbits and how long each planet might take in Earth years to orbit the sun – ask children to research key facts about the planets and how they orbit the sun – see resource sheet. To support the children's understanding that the planets move in a slightly oval orbit around the sun they will take part in a role play using sports ball or balloons (to represent the planets) and move around the sun. First focus on how the earth travels around the sun and then the other planets. In books, children use a diagram and key facts to explain how the planets move in space. **Examples:**  Today in Science we looked at the rotation of the planets around the sun. Can you please explain their rotation? Consider which way they move, which moves the fastest and why? Which moves the slowest and how long each planet takes. Neptune moves the slowerst and Mercury moves the fastest. It takes the sun a Earth a year to orbit the whole sun and it takes Pluto 249 years to orbit the Sun. Why does Mercury orbit the sun quicker than Neptune? Because Mercury is closest to the sun.  How the planets rotate around the sun. • All 8 planets in our solar system orbit the sun. • As they do so they also spin on their individual axis. • Earth, (our home Planet) rotates from west to east. Which is why we see the sun rise in the east and set in the west. • Venus and Uranus spin on there axis but rotate M	rsystemscope.com/&plans – *look here for planetary movements*	**Ptolemy, heliocentric, geocentric.** orrery	

					
3	L.I. I can set up a test to explain why we have day and night.	**This is a Science lesson. In Science, we study nature and the behaviour of natural things. The skill we will be using this lesson is setting up a test, recording and communicating data.** **Prior learning:** **What is the heliocentric?** **Who was Nicolaus Copernicus?** **What does orbit mean?** **How do the planets orbit the sun?** **Big Question; why do we have day and night?** Show the children three images one of the Earth, Sun and Moon and ask them to think about how they are all the same and how they are different. **Example:**	http://www.bbc.co.uk/education/clips/zvks4wx - *Day and night;* http://www.bbc.co.uk/education/clips/zq32fg8 - *Sun, shadows and time of day;* *http://www.bbc.co.uk/education/clips/ztwykqt How we get day and night;* *http://www.childrensuniversity.manchester.ac.uk/interactives/science/earthandb*	**Earth, Sun, star, rotate/rotation, spin, axis, night and day, shadow clocks, sundials, astronomical clocks opinion/fact, variables, accuracy, precision, support/refute**	

		The children were shown these three images of the Earth, Sun and Moon and asked to think about how they are all the same and how they are different.   This implies that the Earth and Moon or both orbiting. An inaccuracy is present here, as the moon is a satellite not a planet. Melissa demonstrates again that she knows that the Earth, Sun and Moon are spherical Have https://www.nasa.gov/content/goddard/nasa-releases-new-earthrise-simulation-video ready on the IWB. Play from 3:20 to 5:25, discuss in pairs what they think they will be working on during this session. Feedback ideas and establish that you are looking at how day and night are created through the spinning of the Earth. Watch the 2 BBC clips to clarify understanding. Explain that they are going to design and implement a shadow investigation that will demonstrate the spinning of the Earth to their audience and hence why we have day & night. Ask; why an investigation into shadows and day & night might help demonstrate that the Earth spins (not a moving sun across the sky). Use https://www.timeanddate.com/worldclock/sunearth.html to show day and night. Look at the question: **how can shadows show that the Earth is rotating?** Send children off in groups and support them (see planning questions) as they make suggestions. As a class decide how you will carry out the investigation, noting those things that will stay the same (rounder's post, source of light) and the variables (the time of day). Take children outside to an open area that is in sunlight for most of the school day (remind children never to look directly at the sun). Get groups to set up a rounder's post and draw around the shadow (including the base, in case it moves). Measure the shadow length and note how defined it is - get children to record this on the sample table as well as labelling the shadow with the time of day. Also get children to use a compass to note where the sun is ('*overhead*' for midday) as well as the direction of the shadow. Ask children to predict what will happen in the hours leading up to midday and then in the afternoon (length, direction and definition of shadows and why - see investigation questions). Redraw the shadow every hour, labelling the time it was drawn and recording the length and definition of it. Get children to graph results at the end of the day, choosing an appropriate graph form (see graph help sheet in resources). Once the shadow investigation is initially set up, explain that children are going to explore further how shadows and day & night help us to understand and demonstrate the spinning motion of the Earth.	*eyond/shadows/ - Exploring shadows.* Shadows investigation questions, rounders post and stand, measuring equipment and compass, globe, Lego™ figures, torch, sample table for recording (including completed e.g.)		

		- Lesson credited to Hamilton Trust.			
4	L.I. I can explore the phases of the moon by making a lunar month simulation 	**This is a Science lesson. In Science, we study nature and the behaviour of natural things. The skill we will be using this lesson is making observations** **Prior learning: Explorify – What if the earth was not on an axis?** Explain that you have images of something Galileo described in great detail after looking through his highly advanced (at the time) telescope (Galileo was the first to make close observations of the moon using a telescope). Chn look at the moon images and decide in pairs what it is they are looking at. Show them the Vimeo simulation and ask them to describe what they can see and if they can identify any of the spheres (Earth, moon and sun). Look at the BBC stargazing moon guide and the moon images and explain that a moon is a celestial body that orbits a planet (check that they know that we have one moon). **Can they remember from their earlier research which other planet in our solar system has moons?** (Jupiter has 4 large moons and numerous small ones.) - **Role play the moons orbit around earth and the earth's orbit around the sun. Ask children to record what they know in a diagram.** Get children to examine the images of the moon and identify seas, etc. using the given map. Children identify and label these features on the main photo. Watch NASA moon evolution video. Explain the children will explore a moon month to help understand its movements. **Why do they think the moon is in orbit around the Earth?** Explain that the force of gravity already mentioned from the Earth is greater than that of the moon because the Earth has a greater mass, therefore the Earth keeps the moon where it is - the moon can't escape, if you like - show BBC clip on the moon's orbit for clarification. – Children should draw upon their prior learning on gravity and forces from earlier in the year. **How and why you think the moon appears to change shape?** Show the 2nd BBC clip and check misconceptions about the moon being a source of light, or actually changing shape. Explain that children will investigate the movement & appearance of the moon and the impact it has on the Earth. Show children the 3rd BBC clip, and explain that children will create their own simulation for their programme as well as identify the moon phases and how they relate to the lunar month. **Lunar phases investigation**: get children to recreate a lunar month simulation (as in video clip) and get children to explain why, scientifically, the appearance is changing. Get children to match moon phases to the lunar cycle diagram while they look at the lunar month sheets for the names of each phase - can they match what is being seen as they move their moon around the Earth and create a diagram to show this? Examine the current month's moon phases (Moon Connection link) and challenge/support children to model lunar and solar eclipses. Get children to video the model in action as they explain the various phases in the lunar month as well as eclipses. Phases of the moon – use homework to support.	Role-play information. https://vimeo.com/134281404 - *Close up of the moon;* https://www.bbc.com/education/guides/zk8hvcw/revision/5- *Size & gravitational field strength;* http://www.bbc.co.uk/education/clips/zy4pr82 - *Moon's orbit round Earth;* http://www.bbc.co.uk/programmes/p00n6zhl - *Stargazing: phases of the moon;* https://www.youtube.com/watch?v=UIKmSQqp8wY – *NASA-evolution of the moon;* http://www.moonconnection.com/moon_phases_calendar.phtml	**Earth, Moon, celestial body, sphere/spherical, rotate/rotation, spin, orbit, support/refute, eclipse, light, reflection, telescope, satellite, tide, mass, gravity**	

		- Lesson credited to Hamilton Trust. **Exit Pass:** concept cartoon – children use what they know to respond to each child's comment. **Researching the movement of the Earth and moon** • 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  The children were shown videos that demonstrated the movement of the Earth and the moon and then presented with the concept cartoon to discuss. The sun does not spin The Earth spins on its axis and this takes 24 hours The earth travels around the sun. It takes approximately 365 days The moon travels around the Earth and this takes 28 days Melissa demonstrates that she understands the key facts.	- *Moon phases calendar;* Moon images, lunar month sheet, moon phases and lunar cycle diagram, lunar and solar eclipses diagram, suggested sources of info for moon and tides		
5.		**Class trip to Liverpool Museum.** Repeat sorting activity form lesson 1 and ask the children to add to their thought showers to show everything they now know about earth and space.			