Broadway Junior School

Subject: Science | Topic: Earth and Space | Year: 5 | Term: Autumn 1

NC Purpose of Study
A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.

Intent	Implementation	Impact
At Broadway Junior School we believe that a high quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational 'Big Ideas', pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes. Science in our school is about developing children's ideas and ways of working that enable them to make sense of the world in which they live through investigation, as well as using and applying process skills. The staff here ensure that all children are exposed to high quality teaching and learning experiences, which allow children to explore their outdoor environment and locality, thus developing their scientific enquiry and investigative skills. They are immersed in scientific vocabulary, which aids children's knowledge and understanding not only of the topic they are studying, but of the world around them. We intend to provide all children regardless of ethnic origin, gender, class, aptitude or disability, with a broad and balanced science curriculum.	Teachers create a positive attitude to science learning within their classrooms and reinforce an expectation that all children are capable of achieving high standards in science. Our whole school approach to the teaching and learning of science involves the following: Science will be taught in planned and arranged blocks by the class teacher, to have a subject specific approach. This is a strategy to enable the achievement of a greater depth of knowledge. Through our planning, we involve problem solving opportunities that allow children to find out for themselves. Children are encouraged to ask their own questions and be given opportunities to use their scientific skills and research to discover the answers. This curiosity is celebrated within the classroom. Planning involves teachers creating engaging lessons, often involving high-quality resources to aid understanding of conceptual knowledge. Teachers use precise questioning in class to test conceptual knowledge and skills, and assess children regularly to identify those children with gaps in learning, so that all children keep up. Teachers build upon the learning and skill development of the previous years. As the children's knowledge and understanding increases, and they become more proficient in selecting, using scientific equipment, collating and interpreting results, they become increasingly confident in their growing ability to come to conclusions based on real evidence. Working Scientifically skills are embedded into lessons to ensure these skills are being developed throughout the children's school career and new vocabulary and challenging concepts are introduced through direct teaching. This is developed through the years, in-keeping with the topics.	The impact and measure of this is to ensure children not only acquire the appropriate age related knowledge linked to the science curriculum, but also skills which equip them to progress from their starting points, and within their everyday lives. All children will have: • A wider variety of skills linked to both scientific knowledge and understanding, and scientific enquiry/investigative skills • A richer vocabulary which will enable to articulate their understanding of taught concepts • High aspirations, which will see them through to further study, work and a successful adult life.

Key Vocabulary
Solar System, Sun, planet, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, orbit, rotate, revolution, axis, spherical, gravity, Moon, satellite, crater, phase, crescent, gibbous, full moon, new moon, waxing, waning, shadow, day, night, time zone, astronomer, heliocentric.

Knowledge	Skills
Children will know: • The Solar System consists of the Sun and eight planets. • The planets orbit the Sun. • The Sun, Earth and Moon are approximately spherical bodies. • Gravity keeps planets in orbit around the Sun. • The Moon is Earth's natural satellite. • The Earth rotates on its axis once every 24 hours. • The Earth's rotation causes day and night. • The Moon orbits the Earth approximately every 27 days. • The Moon's phases are caused by the changing positions of the Sun, Earth and Moon	By the end of the unit, pupils will be able to: • Identify and order the planets in the Solar System. • Explain why the Sun, Earth and Moon are spherical. • Describe planetary orbits. • Research and present information about significant astronomers. • Explain the movement of the Moon. • Carry out practical investigations. • Observe patterns over time. • Use scientific models to explain scientific ideas. • Draw conclusions using evidence

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Enrichment Opportunities

- Create a scale Solar System outside.
- Observe the Moon over several weeks.
- Visit a local planetarium or observatory.
- Use space simulation software.
- Link with Geography by exploring time zones.
- Link with History by studying famous astronomers.

Learning Objectives/End Points

Pupils will be able to:

- Name and order the planets.
- Explain why the Solar System is called "solar."
- Describe the Sun, Earth and Moon as spherical bodies.
- Explain how gravity keeps planets in orbit.
- Describe how the Earth and Moon move.
- Explain day and night.
- Explain why the Moon appears to change shape.
- Use scientific evidence to explain observations.

Key Questions/Learning Objectives/End Points

To identify the planets in the Solar System and order them by distance from the Sun. Create a model of the Solar System	**To explain why the Sun, Earth and Moon are approximately spherical bodies** Create spherical planet models and investigate gravity using balls of different sizes.	(TAPS Focused Assessment) To research and present information about the Solar System using scientific sources. Children research a planet or feature of the Solar System, recording information and presenting findings using the TAPS assessment framework.	(TAPS Focused Assessment) To investigate how craters form on the Moon and explain that the Moon is Earth's natural satellite. Craters investigation using flour, cocoa powder and marbles. .	**To explain why we have day and night** Torch and globe investigation to model Earth's rotation. Research time zones and shadows.	**To explain why the Moon appears to change shape.** Observe Moon phases using a lamp and ball model or recorded observations over time.
Starter (10 mins) Show images of the Solar System. Ask: *What do you already know about space?* **Main (40 mins)** Introduce the Sun and eight planets. Explain the meaning of the word *solar*.	**Starter (10 mins)** Show a football, marble and cube. Ask: *Which shape best represents a planet? Why?* **Main (40 mins)** Explain the term *spherical*. Discuss how gravity pulls matter towards the centre, creating a spherical shape.	**Starter (10 mins)** Recap the names and order of the planets. Discuss: *How do scientists learn about places they cannot visit?* **Main (40 mins)** Introduce the TAPS Focused Assessment. Children independently research one aspect of the Solar System	**Starter (10 mins)** Show close-up photographs of the Moon's surface. Ask: Why do you think the Moon has so many craters? Why doesn't the Earth have as many visible craters? **Main (40 mins)** Explain that:	**Starter (10 mins)** Ask: *Why is it daytime here when it is night somewhere else?* **Main (40 mins)** Demonstrate Earth's rotation using a globe and torch. Explore time zones. Research why shadows change length during the day and why	**Starter (10 mins)** Show photographs of different Moon phases. Ask: *Has the Moon really changed shape?* **Main (40 mins)** Explain the Moon's phases using a lamp and ball model. Children sequence the phases.

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Children order the planets from the Sun. Practical: Create a model of the planets using clay, paper or card. **Plenary (10 mins)** Planet ordering challenge. Recite the planets together using a mnemonic.	Practical: Continue creating accurate planet models and compare spheres with other shapes. **Plenary (10 mins)** Children explain why planets are spherical using the words *gravity* and *sphere*.	(e.g. a planet, the Sun, asteroids or dwarf planets) using books and/or trusted websites. They record: Key facts Size Distance from the Sun (where appropriate) Length of a year Interesting features Children present their findings as a fact file, poster or short presentation. **Plenary (10 mins)** Children share one new fact they have discovered. Class discusses: Which sources were the most useful? Why is it important to use reliable scientific information?	The Moon is Earth's natural satellite. It orbits the Earth approximately every 27 days. Many craters were formed when rocks from space (meteorites) struck the Moon millions of years ago. The Moon has very little atmosphere, so most meteorites reach its surface. TAPS Focused Assessment Children predict what will happen when different-sized marbles are dropped into trays containing flour covered with cocoa powder. Investigate how changing the size or height of the marble affects the crater formed. Record observations and measurements. Draw conclusions using evidence from their investigation. **Plenary (10 mins)** Discuss: Which variable created the largest crater? How did your results support your prediction? Why does the Moon still have so many craters today?	daylight hours vary across the year. **Plenary (10 mins)** Children explain day and night using the globe model.	Observe or record Moon phases over time. **Plenary (10 mins)** Exit ticket: Why does the Moon appear to change shape? Does the Moon produce its own light? What causes the different phases?

Substantive Knowledge

- The Sun is a star at the centre of the Solar System.
- Eight planets orbit the Sun.
- Gravity causes planets and moons to remain in orbit.
- The Earth rotates on its axis every 24 hours.
- The Earth orbits the Sun once every year.
- The Moon orbits the Earth.
- The Moon reflects sunlight.
- Moon phases result from the relative positions of the Earth, Moon and Sun.

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Careers	
Linking Curriculum Learning to Careers Discuss how the skills developed in this unit are used in a range of careers, including: • Astronomer • Planetary Scientist • Space Scientist • Space Researcher • Astronomy Researcher • Science Communicator • Planetarium Presenter • Aerospace Engineer • Spacecraft Engineer • Satellite Engineer • Mechanical Engineer • Electrical Engineer • Astronaut • Mission Specialist • Space Mission Controller • Spacecraft Operator • Flight Director • Space Mission Planner Transferable skills such as Scientific Enquiry Curiosity Observation Investigation Problem solving Teamwork Communication Research Organisation Attention to detail Classification Data handling Critical thinking Decision making Creativity Resilience Responsibility Confidence	**Learning from Career and Labour Market Information** • Introduce pupils to careers in astronomy, space exploration, engineering, satellite technology, meteorology, astrophysics and scientific research. Explore how space-related careers contribute to communication, navigation, weather forecasting, environmental monitoring and exploration. **Addressing the Needs of Each Pupil** • Provide a range of opportunities for pupils to explore space careers through practical modelling, research, discussion, technology, observation and creative presentation. Ensure pupils recognise that space careers require a wide variety of strengths, including mathematical, scientific, technical, creative and communication skills. **Linking Curriculum Learning to Careers** • Explicitly link the Solar System and planets to astronomers and planetary scientists; gravity and orbits to physicists and aerospace engineers; space observation to astronomers; satellites to satellite engineers; Moon and planetary research to planetary scientists; and space technology to engineers, programmers and technicians. **Encounters with Employers and Employees** • Invite an astronomer, aerospace engineer, satellite engineer, physicist or science communicator to speak to pupils. Pupils could prepare questions about their role, equipment, workplace, qualifications, career journey and the Science and Maths skills they use **Experiences of Workplaces** • Explore photographs, videos or virtual tours of observatories, planetariums, research laboratories, engineering facilities, satellite control centres and space agencies. Identify the different professionals who work together to research and explore space.