Broadway Junior School

Subject: Science | Topic: Light | Year: 6 | Term: Spring 2

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
Light Light source Ray Light ray Travel Reflect Reflection Mirror Angle of incidence Angle of reflection Periscope Prism Spectrum Refraction Shadow Opaque Transparent Translucent Eye Retina Pupil Iris Optic nerve

Knowledge	Skills
• Know that light travels in straight lines. • Understand that we see objects because light travels from a light source, reflects from objects and enters our eyes. • Know the basic structure and function of the human eye. • Understand that mirrors reflect light. • Explain how shadows are formed. • Understand that the size and shape of shadows depend on the position of the light source. • Use scientific enquiry to investigate light and shadows.	• Use models and diagrams to explain how light travels. • Draw ray diagrams using straight lines and arrows. • Make predictions before investigations. • Plan and carry out comparative and fair tests. • Measure and record observations accurately. • Identify patterns in results. • Draw conclusions using scientific evidence. • Communicate findings using scientific vocabulary.

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Enrichment Opportunities
• Build a simple periscope. • Investigate reflections using mirrors. • Explore shadow puppets and shadow art. • Outdoor shadow investigations throughout the day.

Learning Objectives/End Points
Pupils will be able to: • Explain how light travels. • Describe how the human eye enables us to see. • Use ray diagrams to represent light travelling in straight lines. • Explain how shadows are formed. • Predict how shadows change when the position of the light source changes. • Plan and evaluate scientific investigations involving light.

Key Questions/Learning Objectives/End Points					
How do we see and how does light travel? Explain that light travels in straight lines. Describe how light enters the eye and enables vision.	How can we answer scientific questions about light? (TAPS Focused Assessment) Plan and carry out investigations to answer questions about light. Use evidence to explain observations.	How are shadows formed? Explain why shadows are created. Predict how shadows change when light sources move.	How can we investigate shadows scientifically? (TAPS Focused Assessment) Plan and carry out a fair test investigating shadows. Analyse results and explain conclusions using scientific evidence.	Reflection – Investigate how light reflects from different surfaces and understand that the angle of incidence equals the angle of reflection.	Making a Periscope – Apply knowledge of reflection to design and construct a working periscope.
Explore the structure of the eye and explain how light travels in straight lines from a source, reflects from objects and enters the eye. (Outstanding Science: Seeing Light) Use models and ray diagrams to investigate how light travels. Label the parts of the eye and create ray diagrams showing how we see objects. Explore reflection using mirrors.	Children investigate and answer scientific questions about light, such as "Can light travel around corners?" or "Which material reflects light best?" They plan a comparative test, identify variables, collect evidence and justify their conclusions.	Shadows – Investigate how shadows are formed and why they change size and shape. (Outstanding Science: Shadows) Explore how moving the light source or object affects shadows. Measure shadow size and identify patterns using ray diagrams to explain observations.	Children investigate the question "How does changing the distance between the light source and an object affect the size of its shadow?" They plan a fair test, make predictions, record measurements, identify patterns and explain their conclusions using scientific vocabulary.	Use mirrors and torches to investigate reflection. Trace the path of light rays, measure angles of reflection and identify materials that are good reflectors.	Build a simple periscope using mirrors, card and tape. Test how light reflects inside the periscope and explain how reflection allows us to see around obstacles.

Substantive Knowledge
• Living things can be classified according to their observable characteristics. • Classification helps scientists organise, identify and study living organisms. • Organisms can be grouped by their similarities and differences. • Carl Linnaeus developed a hierarchical classification system that is still used today. • Classification keys help identify unknown organisms by answering questions about their characteristics. • Vertebrates have a backbone; invertebrates do not.

- Invertebrates can be grouped according to shared features such as body structure and number of legs.
- Living things are organised into groups such as kingdom, phylum, class, order, family, genus and species.
- Microorganisms are living organisms too small to be seen without a microscope.
- Common microorganisms include bacteria, fungi and yeast.
- Mould is a type of fungus.
- Mould grows best in warm, damp conditions and reproduces by releasing spores.
- Some microorganisms are useful (e.g. making bread and yoghurt), while others can cause disease or food spoilage. The number of cells in a circuit can affect how components work.

Careers

Linking Curriculum Learning to Careers

Discuss how the skills developed in this unit are used in a range of careers, including:

- Optometrist
- Optical technician
- Optical assistant
- Physicist
- Optical physicist
- Research scientist
- Experimental physicist
- Materials scientist
- Engineering technician
- Instrumentation engineer
- Telecommunications engineer
- Fibre-optic engineer
- Medical technology engineer
- Laser technician
- Photographer
- Scientific photographer
- Medical photographer
- Film director
- Cinematographer
- Camera operator
- Lighting technician
- Lighting designer
- Film lighting technician
- Studio photographer

Transferable skills such as 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 such as optometrists, ophthalmologists, optical technicians, photographers, lighting designers, optical engineers, physicists and astronomers. Discuss how developments in optical technology, digital imaging, medical equipment and renewable technologies create new career opportunities.

Addressing the needs of each pupil

- Use practical investigations, models, diagrams, outdoor learning, creative activities and discussion to provide different ways for pupils to demonstrate their understanding. Encourage pupils to recognise their individual strengths in scientific thinking, creativity, practical work, communication and problem-solving.

Linking curriculum learning to careers

- Link light travelling in straight lines and reflection to physicists, optical engineers and lighting designers; the human eye to optometrists, ophthalmologists and vision scientists; shadows and light investigations to photographers and scientists; periscopes and mirrors to engineers and designers; and scientific enquiry to research scientists.

Encounters with employers and employees

- Invite an optometrist, optician, photographer, lighting technician, engineer, ophthalmologist or scientist to discuss how they use light in their work.

Experiences of workplaces

- Explore workplaces including opticians, hospitals, photography studios, theatres, film sets, laboratories, engineering companies, observatories, museums and design studios through visits, photographs, videos or virtual tours.

Encounters with further and higher education

- Highlight pathways through GCSE Science and Maths, A levels, T Levels, college, university, apprenticeships and technical training. Link these to careers in optics, engineering, physics, photography, medicine and technology.