



Year One – Light

National Curriculum Objectives:

- Observe changes across the four seasons
- Observe and describe weather associated with the seasons and how day length varies.
- Pupils should observe and talk about changes in the weather and the seasons.

Note: Pupils should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses. Pupils might work scientifically by: making tables and charts about the weather; and making displays of what happens in the world around them, including day length, as the seasons change.

Inspiring science key ideas:

- Observe changes across the four seasons .
- Observe and describe weather associated with the seasons and how day length varies.
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Working scientifically

- Making tables and charts about the weather.
- Making displays of what happens in the world around them, including day length, as the seasons change. Additional suggestion from Lancashire for working scientifically opportunities which enhance learning and support using ICT across the curriculum
- This unit provides an ideal opportunity for using data logging equipment to record temperatures.

<p>Prior learning</p>	<p><b>Key Learning – What the pupils need to know</b></p> <p><b>This is a longitudinal Study - Children should carry out a study of the environment over the entire year. This should be carried out in both Year 1 and 2 to embed the ideas of change. Children should draw conclusions from what they find and make suggestions for how they expect things to change. In tracking temperature and rainfall, pupils can make suggestions for why certain things happen and certain times in the year. Tipping points of temperature are vital as two degree change can impact a wide range of organisms meaning they are no longer visibly present in the local area.</b></p>	<p><b>Vocabulary</b></p>
<p>In Early Years:</p> <ul style="list-style-type: none"> <li>• Developing an understanding of change.</li> <li>• Observe and explain why certain things may occur (e.g leaves falling off trees, weather changes).</li> <li>• Look closely at similarities, differences, patterns and change.</li> <li>• Comments and questions about the place they live or the natural world</li> </ul>	<p>Why do more frequent days of rain saturate the ground? How long does it take for the ground to dry after it has been raining? (Does more water take longer to dry?) Do countries with a higher temperature have less rain? (compare UK and one other country as a minimum) Track rain fall and temperature in different areas of the school grounds.</p> <p>Investigate the properties of leaves (Which leaf is strongest? Which is most effective at shade cover? Which is most effective at directing water? Which turns brown quickest? What do you notice about the different leaves? (Use ID cards to identify trees in grounds) What purpose do leaves serve for the tree? Why do you think leaves turn brown in Winter?) Sticky Cards– collect colours from the outdoors (Why did you choose to select that object to add to your card? Why did you choose to select that colour to add to your card? Will you be able to collect that in a different season?)</p> <p>And down came the rain (What effect does rain have on the environment? How might it be change on different soil types? How does it differ in the nature trail? What would the effect on the environment be if there was too much rain? What would the effect on the environment be if there was not enough rain?)</p>	<p>Seasons, spring, summer, autumn, winter, windy, sunny, overcast, snow, rain, temperature</p>

In Year 3:

- Recognise that they need light in order to see things and that dark is the absence of light.
- Notice that light is reflected from surfaces.
- Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.
- Recognise that shadows are formed when the light from a light source is blocked by a solid object.
- Find patterns in the way that the sizes of shadows change.



Year Three – Light

National Curriculum Objectives:

- Recognise that they need light in order to see things and that dark is the absence of light.
- Notice that light is reflected from surfaces.
- Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.
- Recognise that shadows are formed when the light from a light source is blocked by a solid object.
- Find patterns in the way that the sizes of shadows change.

*Non statutory: Pupils should explore what happens when light reflects off a mirror or other reflective surfaces, including playing mirror games to help them to answer questions about how light behaves. They should think about why it is important to protect their eyes from bright lights. They should look for, and measure, shadows, and find out how they are formed and what might cause the shadows to change. Note: Pupils should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses. Pupils might work scientifically by: looking for patterns in what happens to shadows when the light source moves or the distance between the light source and the object changes.*

Inspiring science key ideas:

- Recognise that they need light in order to see things and that dark is the absence of light.
- Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.
- Recognise that shadows are formed when the light from a light source is blocked by a solid object .
- Find patterns in the way that the size of shadows change.

Working scientifically

- *looking for patterns* in what happens to shadows when the light source moves or the distance between the light source and the object changes

<u>Prior learning</u>	<u>Key Learning – What the pupils need to know</u>	<u>Vocabulary</u>
<p>In Year 1:</p> <ul style="list-style-type: none"> <li>• Name the seasons and know about the type of weather in each season</li> <li>• May have some knowledge of where light comes from.</li> <li>• Will most likely have seen their shadows and may know they appear when it is sunny.</li> <li>• Some understanding of a reflection.</li> <li>• May understand they need light to be able to see things.</li> </ul>	<p>We can only see things when there is light and the light had to come from somewhere. All light originally comes from a light source. When light hits an object it can do a number of things</p> <ul style="list-style-type: none"> <li>• If the object is transparent it will go through it and we will be able to see through it.</li> <li>• If the object is opaque it will block the light and no light will get through.</li> <li>• If the object is perfectly reflective light will bounce back off it and we will see reflections of objects. If the material is translucent it will allow light through but we won't be able to see through it.</li> </ul>	<p>Light source, dark, reflect, ray, mirror, bounce, visible, beam, sun, glare, travel, straight, opaque, shadow, block, transparent</p>
<p>In Year 5</p> <ul style="list-style-type: none"> <li>• Recognise that light appears to travel in straight lines.</li> <li>• Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye.</li> <li>• Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes.</li> <li>• Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.</li> <li>• Know how simple optical instruments work, e.g. periscope, telescope, binoculars, mirror, magnifying glass etc.</li> </ul>		



**Year Five – Earth and space**

<p><b>National Curriculum Objectives:</b></p> <ul style="list-style-type: none"> <li>• Describe the movement of the Earth, and other planets, relative to the Sun in the solar system</li> <li>• Describe the movement of the Moon relative to the Earth</li> <li>• Describe the Sun, Earth and Moon as approximately spherical bodies</li> <li>• Describe the idea of the Earth’s rotation to explain day and night and the apparent movement of the sun across the sky.</li> </ul> <p><i>Pupils should be introduced to a model of the Sun and Earth that enables them to explain day and night. Pupils should learn that the Sun is a star at the centre of our solar system and that it has eight planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune (Pluto was reclassified as a ‘dwarf planet’ in 2006). They should understand that a moon is a celestial body that orbits a planet (Earth has one moon; Jupiter has four large moons and numerous smaller ones).</i></p> <p><b>Note:</b> Pupils should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses.</p> <p><i>Pupils should find out about the way that ideas about the solar system have developed, understanding how the geocentric model of the solar system gave way to the heliocentric model by considering the work of scientists such as Ptolemy, Alhazen and Copernicus.</i></p>		<p><b>Inspiring science key ideas:</b></p> <ul style="list-style-type: none"> <li>▪ Describe the movement of the Earth, and other planets, relative to the Sun in the solar system.</li> <li>▪ Describe the movement of the Moon relative to the Earth.</li> <li>▪ Describe the Sun, Earth and Moon as approximately spherical bodies.</li> <li>▪ Use the idea of the Earth’s rotation to explain day and night.</li> <li>□ The Earth spins once around its own axis in 24 hours, giving day and night.</li> <li>□ The Earth orbits the Sun in one year.</li> <li>□ We can see the Moon because the Sun's light reflects off it.</li> <li>□ The Moon orbits the Earth in approximately 28 days and changes to the appearance of the moon are evidence of this.</li> <li>□ The Sun <i>appears</i> to move across the sky from East to West and this causes shadows to change during the day.</li> <li>□ Changes to shadow length over a day or changes to sunrise and sunset times over a year are evidence supporting the movement of the Earth.</li> <li>• (See <b>UKS2 ‘Forces’</b> for Key Learning on gravity).</li> </ul> <p><b>Working scientifically</b></p> <ul style="list-style-type: none"> <li>○ <i>Comparing the time of day at different places on the Earth through internet links and direct communication.</i></li> <li>○ <i>Creating simple models of the solar system.</i></li> <li>○ <i>Constructing simple shadow clocks and sundials, calibrated to show midday and the start and end of the school day.</i></li> <li>○ <i>Finding out why some people think that structures such as Stonehenge might have been used as astronomical clocks. [research]</i></li> </ul>	
<p><u>Prior learning</u></p>	<p>(See <b>‘Forces’</b> for Key Learning on gravity linked to this unit).</p>	<p><b>Key Learning – What the pupils need to know</b></p>	<p><b>Vocabulary</b></p>
<p>In Year 3:</p> <ul style="list-style-type: none"> <li>• Recognise that they need light in order to see things and that dark is the absence of light.</li> <li>• Notice that light is reflected from surfaces.</li> <li>• Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.</li> <li>• Recognise that shadows are formed when the light from a light source is blocked by a solid object.</li> <li>• Find patterns in the way that the sizes of shadows change.</li> </ul>		<ul style="list-style-type: none"> <li>• What do we know about the Earth, Sun and Moon?</li> <li>• How do the Earth, Sun and Moon fit within our solar system?</li> <li>• How do we get day and night?</li> <li>• What do we know about the shape and movement of the Earth?</li> <li>• Why does the moon appear to change shape?</li> <li>• How do shadows, created by the sun, change during a day?</li> <li>• How were shadows used in the past to help people tell the time?</li> <li>• The universe is vast and contains billions of stars.</li> <li>• The solar system is a collection of planets and moons orbiting our nearest star, the sun. It can be represented using a model.</li> </ul> <p>All objects in the solar system are spinning as well as orbiting.</p> <ul style="list-style-type: none"> <li>• The time it takes for an object to spin once is called a day</li> <li>• The time it takes a planet to orbit the un is called a year</li> </ul> <p>Stars produce vast amounts of heat and light. All other objects are lumps of rock, metal or ice and can be seen because they reflect the light of stars</p>	
		<p>Sphere/spherical, revolve, orbit, spin, rotate, axis, sunrise, sunset, north, south, east, west, rotate around, rotate on its axis</p> <p>Solar system, Sun, Moon, star, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, planet</p> <p>Sundial, shadow clock</p> <p>Model, compare, evidence</p> <p>Earth, Sun, Moon, Axis, Rotation, Day, Night, Phases of the Moon, star, constellation, waxing, waning, crescent, gibbous. Mercury, Venus, Mars, Jupiter, Saturn, Uranus,</p>	



	<p>How would a solar eclipse be different if: a) The moon was a different size? b) The earth spin faster or slower? c) The sun was large or smaller. d) If the earth and moon were the same size but further away in the solar system.</p>	<p>Neptune, planets, solar system, day, night, rotate, orbit, axis, spherical, geocentric, heliocentric.</p>
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In Year 6  
Recognise that light appears to travel in straight lines.

- Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye.
- Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes.
- Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.
- Know how simple optical instruments work, e.g. periscope, telescope, binoculars, mirror, magnifying glass etc.



**The Cathedral School Of St Peter and St John R.C Primary**

**Light and Astronomy**





Year Six – Light and how it travels

National Curriculum Objectives:

Recognise that light appears to travel in straight lines.

- Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye.
- Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes.
- Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.
- Know how simple optical instruments work, e.g. periscope, telescope, binoculars, mirror, magnifying glass etc.

Non statutory: Pupils should build on the work on light in year 3, exploring the way that light behaves, including light sources, reflection and shadows. They should talk about what happens and make predictions. Pupils might work scientifically by: deciding where to place rear-view mirrors on cars; designing and making a periscope and using the idea that light appears to travel in straight lines to explain how it works. They might investigate the relationship between light sources, objects and shadows by using shadow puppets. They could extend their experience of light by looking a range of phenomena including rainbows, colours on soap bubbles, objects looking bent in water and coloured filters (they do not need to explain why these phenomena occur).

Inspiring science key ideas:

- Recognise that light appears to travel in straight lines.
- Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye.
- Explain that we see things because the light that travels from light sources to our eyes or from light sources to objects and then to our eyes.
- Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.

Working scientifically

- Deciding [observe/explore] where to place rear-view mirrors on cars.
- Designing and making a periscope and using the idea that light appears to travel in straight lines to explain how it works.
- Investigating the relationship between light sources, objects and shadows by using shadow puppets extend their experience of [explore and observe] light by looking at a range of phenomena including rainbows, colours on soap bubbles, objects looking bent in water and coloured filters (they do not need to explain why these phenomena occur).

Prior learning

Key Learning – What the pupils need to know

Vocabulary

- How does light travel?
  - How do we see?
  - How does light get into our eyes?
  - How can we use mirrors to see behind us?
  - How do shadows created by the sun change during a day?
  - How can we represent light travelling in drawings?
  - Can you make simple drawings to help to explain how light travels?
- How does light behave?



<p>In Year 3:</p> <ul style="list-style-type: none"> <li>• Recognise that they need light in order to see things and that dark is the absence of light.</li> <li>• Notice that light is reflected from surfaces.</li> <li>• Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.</li> <li>• Recognise that shadows are formed when the light from a light source is blocked by a solid object.</li> <li>• Find patterns in the way that the sizes of shadows change.</li> </ul>	<p>When light is emitted from a light source it travels in straight lines until it hits an object. This can be represented by an arrow.</p> <ul style="list-style-type: none"> <li>• Shadows form when light hits an opaque object, the area behind is in darkness because light can only travel in straight lines</li> </ul> <p>When light hits a transparent object it goes through it in a straight line so we can see a clear image through it. When light hits a translucent material it goes through it but is scattered, this means light can pass through but we can't see an image through it.</p> <ul style="list-style-type: none"> <li>• When light hits a mirrored surface it reflects off it in straight lines, so we can see an image in the reflective material Some times when light hits a material it reflects off it in many different directions (it is scattered). In this case light will be reflected but no image will be seen in the material Shiny surfaces are better reflectors and rough surfaces scatter light more. Opaque objects don't allow any light to pass through them.</li> </ul> <p>Animals see objects when light is reflected off the object and enters the eye through the pupil. The pupil changes its size to allow enough, but not too much light into the eye. Too much light damages the eye and too little results in poor quality images.</p>	<p>see, seen, light source, eyes, travel shadow, opaque, block</p> <p>reflect, reflection, mirror, direction</p> <p>light travelling, light beam, straight lines,</p> <p>cast, periscope, rear-view mirror, object, shadow puppet, rainbow, colours, bend, split</p>
<p>In KS3:</p> <ul style="list-style-type: none"> <li>• the similarities and differences between light waves and waves in matter</li> <li>• light waves travelling through a vacuum; speed of light</li> <li>• the transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface Science use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye</li> <li>• light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras</li> <li>• colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection.</li> </ul>		



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