

<b><u>Science Progression of Knowledge</u></b>		<b>Year 3</b>	<b>Topic: Light</b>
<b><u>National Curriculum Objectives:</u></b>	<b><u>Essential Vocabulary:</u></b>	<b><u>Substantive Knowledge:</u></b> - children MUST know this by the end of the unit	<b><u>Working Scientifically Objectives:</u></b>
<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 an opaque object</li> <li>find patterns in the way that the size of shadows change</li> </ul>	<ul style="list-style-type: none"> <li><b><u>Light and seeing:</u></b> <b>dark</b>, absence of light, <b>light source</b>, illuminate, visible, <b>shadow</b>, <b>translucent</b>, energy, block.</li> <li><b><u>Light sources:</u></b> e.g. candle, torch, fire, lantern, lightning.</li> <li><b><u>Reflective light:</u></b> <b>reflect</b>, <b>reflection</b>, surface, <b>ray</b>, scatter, reverse, beam, angle, mirror, moon.</li> <li><b><u>Sun safety:</u></b> dangerous, glare, damage, UV light, UV rating, sunglasses, direct.</li> </ul> <p>Previously introduced vocabulary: <b>opaque</b>, <b>transparent</b>, sunlight, sun.</p>	<ul style="list-style-type: none"> <li>There must be light for us to see. Without light it is dark.</li> <li>Light comes from a source.</li> <li>We need light to see things even shiny things.</li> <li>Transparent materials let light through them and opaque materials don't let light through.</li> <li>Beams of light bounce off some materials (reflection).</li> <li>Shiny materials reflect light beams better than non-shiny materials.</li> </ul>	<ul style="list-style-type: none"> <li>Identify a variety of light sources around my school.</li> <li>Predict which light sources would be strongest, comparing my predictions with a partner and discussing any differences.</li> <li>Explain in my own words why we have night and day, using appropriate vocabulary.</li> <li>Test whether an object is transparent, translucent or opaque by testing what kind of shadow it casts.</li> <li>Explain which shadow diagram is correct, using what I know about how shadows are formed.</li> <li>Investigate how shadows behave, finding ways to make shadows move and make them longer and shorter.</li> <li>Record results from my shadow experiments using diagrams.</li> <li>Predict what I think will happen to a shadow throughout the day.</li> <li>Carry out an experiment to find out what happens to shadows throughout the day, recording my results in a table.</li> <li>Draw conclusions from my shadow investigation to say what I have found out.</li> <li>Experiment with using mirrors to see around corners.</li> </ul>
<b><u>Prior Knowledge:</u></b>	<b><u>Future Knowledge:</u></b>	<b><u>Working at Greater depth:</u></b>	<b><u>Science Enquiry/Key Questions:</u></b>
<p><b>In Year 2 children:</b></p> <ul style="list-style-type: none"> <li>Find out and describe how plants need light to grow and stay healthy.</li> </ul> <p><b>Children may:</b></p> <ul style="list-style-type: none"> <li>have some knowledge of where light comes from.</li> <li>have seen their shadows and may know they appear when it is sunny.</li> <li>have some understanding of a reflection.</li> <li>may understand they need light to be able to see things.</li> </ul>	<p><b>In 6 children will learn:</b></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> </ul>	<ul style="list-style-type: none"> <li>Can they explain why lights need to be bright or dimmer according to need?</li> <li>Can they say what happens to the electricity when more batteries are added?</li> <li>Can they explain why their shadow changes when the light source is moved closer or further from the object?</li> </ul>	<ul style="list-style-type: none"> <li>How would you organise these light sources into natural and artificial sources?</li> <li>How does distance from a light source affect how bright it looks?</li> <li>What is a shadow?</li> <li>How can we change the darkness, size and shape of a shadow?</li> <li>Does the distance of the object from the light source affect the length of the shadow?</li> </ul>

# Science Progression of Knowledge

Year 4

Topic: Sound

<u>National Curriculum Objectives:</u>	<u>Essential Vocabulary:</u>	<u>Substantive Knowledge:</u> - children MUST know this by the end of the unit	<u>Working Scientifically Objectives:</u>
<ul style="list-style-type: none"> <li>identify how sounds are made, associating some of them with something vibrating</li> <li>recognise that vibrations from sounds travel through a medium to the ear</li> <li>find patterns between the pitch of a sound and features of the object that produced it</li> <li>find patterns between the volume of a sound and the strength of the vibrations that produced it</li> <li>recognise that sounds get fainter as the distance from the sound source increases</li> </ul>	<ul style="list-style-type: none"> <li><u>Parts of the ear:</u> <b>eardrum.</b></li> <li><u>Making sound:</u> <b>vibration</b>, vocal cords, <b>particles.</b></li> <li><u>Measuring sound:</u> <b>pitch</b>, <b>volume</b>, <b>amplitude</b>, <b>sound wave</b>, quiet, loud, high, low, travel, <b>distance.</b></li> <li><u>Other:</u> <b>soundproof</b>, <b>absorb sound.</b></li> </ul>	<ul style="list-style-type: none"> <li>Sound travel can be blocked.</li> <li>Sound spreads out as it travels.</li> <li>Changing the shape, size and material of an object will change the sound it produces.</li> <li>Sound is produced when an object vibrates.</li> <li>Changing the way an object vibrates changes it's sound.</li> <li>Sound moves through all materials by making them vibrate.</li> <li>Bigger vibrations produce louder sounds and smaller vibrations produce quieter sounds.</li> <li>Faster vibrations (higher frequencies) produce higher pitched sounds.</li> </ul>	<ul style="list-style-type: none"> <li>Investigate a range of objects that show visible vibrations to help me understand how sound waves work.</li> <li>Predict how well sound will travel through a variety of different materials.</li> <li>Plan, set up and carry out an experiment to answer the question, 'Do sound waves travel through all materials equally?'</li> <li>Generate questions to investigate what Happens to a sound as you get further away from it.</li> <li>Plan, set up and carry out an experiment to see which materials are best for soundproofing.</li> <li>Draw conclusions from my investigations to answer a question.</li> <li>Make predictions about the pitch and volume an instrument will produce, using my knowledge of how sound works.</li> <li>Draw a diagram to show how and why the pitch changes on a glockenspiel.</li> <li>Investigate a variety of stringed instruments to explore how the pitch changes according to the length, thickness and tightness of the string, and record my findings.</li> <li>Predict which bottle would produce the highest pitch when different amounts of water are inside, then test my prediction and record my results.</li> </ul>
<u>Prior Knowledge:</u>	<u>Future Knowledge:</u>	<u>Working at Greater depth:</u>	<u>Science Enquiry/Key Questions:</u>
<p><b>In KS1 children:</b></p> <ul style="list-style-type: none"> <li>may have some understanding that objects make different sounds.</li> <li>some understanding that they use their ears to hear sounds.</li> <li>know about their different senses.</li> </ul>	<p><b>In KS3 children will learn about:</b></p> <ul style="list-style-type: none"> <li>frequencies of sound waves measured in hertz (Hz), echoes, reflection and absorption of sound</li> <li>sound needs a medium to travel, the speed of sound in air, in water, in solids</li> <li>sound produced by vibrations of objects, in loudspeakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal</li> <li>auditory range of humans and animals.</li> </ul>	<ul style="list-style-type: none"> <li>Can they explain why sound gets fainter or louder according to the distance?</li> <li>Can they explain how pitch and volume can be changed in a variety of ways?</li> <li>Can they work out which materials give the best insulation for sound?</li> </ul>	<ul style="list-style-type: none"> <li>How can we make different sounds?</li> <li>How can you change the volume of a sound?</li> <li>How does the type of material affect how well it blocks a sound?</li> <li>How does thickness of material affect how well it blocks a sound?</li> <li>Which materials vibrate better and produce louder sounds? Can we identify any patterns?</li> <li>Which materials make the best string telephone components?</li> <li>How does length of the tube affect the pitch and volume?</li> </ul>

Science Progression of Knowledge		Year 6	Topic: Light	
<u>National Curriculum Objectives:</u>	<u>Essential Vocabulary:</u>	<u>Substantive Knowledge:</u> - children MUST know this by the end of the unit	<u>Working Scientifically Objectives:</u>	
<ul style="list-style-type: none"> <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> </ul>	<ul style="list-style-type: none"> <li><u>Reflection:</u> periscope.</li> <li><u>Seeing light:</u> <b>visible spectrum, prism.</b></li> <li><u>How light travels:</u> light waves, wavelength, straight line, <b>refraction.</b></li> </ul> <p>Previously introduced vocabulary: names and properties of materials, absorb.</p>	<ul style="list-style-type: none"> <li>Light travels in straight lines.</li> <li>Light reflects of all objects (unless they are black). Non- shiny surfaces scatter the lightso we don't see a single beam.</li> <li>Animals see light sources when light travels from the source intotheir eyes.</li> <li>Animals see objects when lightis reflected off that object and enters their eyes</li> <li>recognise that light appears to travel in straight lines</li> </ul>	<ul style="list-style-type: none"> <li>Draw on previous knowledge of light and shadow to answer a variety of questions.</li> <li>Use careful observation to identify the pupil, cornea, iris and sclera of the human eye.</li> <li>Use arrows to draw the direction light travels.</li> <li>Label a cross-section diagram of the human eye, explaining the function of each part.</li> <li>Present information about how the eye works in a variety of different ways.</li> <li>Use what I know about the angle of reflection to draw the angle light will reflect off a mirror.</li> <li>Use what I know about the angle of reflection to shine a light beam to a goal using mirrors.</li> <li>Make predictions about which surfaces will reflect a lot of light and which won't.</li> <li>Investigate a variety of surfaces to see which reflect a lot of light and which don't, noting similarities and differences between the two groups.</li> <li>Suggest a variety of investigations to explore how shadows behave.</li> <li>Carry out an investigation to explore what happens to the size and shape of a shadow when an object is moved further away from a light source, recording results in graphs and tables</li> </ul>	
<u>Prior Knowledge:</u>	<u>Future Knowledge:</u>	<u>Working at Greater depth:</u>	<u>Science Enquiry/Key Questions:</u>	
<p><b>In Year 3 children should:</b></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 an opaque object</li> <li>find patterns in the way that the size of shadows change</li> </ul>	<p><b>In KS3 children will learn:</b></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</li> <li>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>	<ul style="list-style-type: none"> <li>Can they explain how different colours of light can be created?</li> <li>Can they use and explain how simple optical instruments work? (periscope, telescope, binoculars, mirror, magnifying glass, Newton's first reflecting telescope)</li> <li>Can they explore a range of phenomena, including rainbows, colours on soap bubbles, objects looking bent in water and coloured filters?</li> </ul>	<ul style="list-style-type: none"> <li>Why does my shadow change length over the course of a day?</li> <li>Does the temperature of a light bulb go up the longer it is on?</li> <li>How does the angle that a light ray hits a plane mirror affect the angle at which it reflects off the surface?</li> <li>Which material is most reflective?</li> <li>Can you identify all the colours of light that make white light when mixed together?</li> <li>What colours do you get if you mix different colours of light together?</li> </ul>	

