



**INSPIRE NURTURE BELIEVE ACHIEVE**

*Working together to be the best that we can be.*

**Happiness**

**Perserverance**

**Resilience**

**Kindness**

**Friendship**

**Respect**

## **Science: Light Progression of Skills and Milestones Document**

## Year 3 Light

- 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 an opaque object
- find patterns in the way that the size of shadows change

### Notes:

*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.*

### Key Vocabulary

Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous

### Common Misconceptions

Some children may think:

- we can still see even where there is an absence of any light • our eyes 'get used to' the dark
- the moon and reflective surfaces are light sources
- a transparent object is a light source
- shadows contain details of the object, such as facial features on their own shadow
- shadows result from objects giving off darkness.

### Activities

- Explore how different objects are more or less visible in different levels of lighting.
- Explore how objects with different surfaces, e.g. shiny vs matt, are more or less visible.
- Explore how shadows vary as the distance between a light source and an object or surface is changed.
- Explore shadows which are connected to and disconnected from the object e.g. shadows of clouds and children in the playground.
- Choose suitable materials to make shadow puppets. • Create artwork using shadows.

*TAPS practical assessments to be used at the end of each unit.*

### Possible Evidence

- Can describe how we see objects in light and can describe dark as the absence of light
- Can state that it is dangerous to view the sun directly and state precautions used to view the sun, for example in eclipses
- Can define transparent, translucent and opaque
- Can describe how shadows are formed
- Can describe patterns in visibility of different objects in different lighting conditions and predict which will be more or less visible as conditions change
- Can clearly explain, giving examples, that objects are not visible in complete darkness
- Can describe and demonstrate how shadows are formed by blocking light

- Can describe, demonstrate and make predictions about patterns in how shadows vary




*Concept Cartoons' and 'Exit Cards' to be used at the end of lessons to assess understanding.*

## Lower Key Stage 2 Working Scientifically

- Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers.

The children make systematic and careful observations. They use a range of equipment for measuring length, time, temperature and capacity. They use standard units for their measurements.

## Proof of Progress (Working Towards, Age Related Expectation or Greater Depth)

<p>Recognise that light is required in order to see things and that dark is the absence of light.</p> <table border="0"> <thead> <tr> <th>Basic</th> <th>Advancing</th> <th>Deep</th> </tr> </thead> <tbody> <tr> <td>Observe and record the effect of light in seeing things.</td> <td>Explain the relationship between light and seeing.</td> <td>Relate your knowledge of the Earth's rotation in space to your understanding of light and dark.</td> </tr> <tr> <td>Answer questions about the effect of light on seeing.</td> <td>Experiment with the effect of different levels of light on the visibility of different coloured objects.</td> <td>True or false? The Sun is the only natural source of light in our solar system. <small>See an example on page 11</small></td> </tr> <tr> <td>Describe darkness.</td> <td>Explain why it is important to dress in high visibility clothing in some situations.</td> <td></td> </tr> </tbody> </table>	Basic	Advancing	Deep	Observe and record the effect of light in seeing things.	Explain the relationship between light and seeing.	Relate your knowledge of the Earth's rotation in space to your understanding of light and dark.	Answer questions about the effect of light on seeing.	Experiment with the effect of different levels of light on the visibility of different coloured objects.	True or false? The Sun is the only natural source of light in our solar system. <small>See an example on page 11</small>	Describe darkness.	Explain why it is important to dress in high visibility clothing in some situations.		<p>Notice that light is reflected from surfaces.</p> <table border="0"> <thead> <tr> <th>Basic</th> <th>Advancing</th> <th>Deep</th> </tr> </thead> <tbody> <tr> <td>Observe light reflected from surfaces.</td> <td>Experiment with light reflecting from a variety of different surfaces.</td> <td>Always, sometimes or never? Dark surfaces do not reflect light as well as those that are light.</td> </tr> <tr> <td>Describe the effect of light reflecting from surfaces.</td> <td>Categorise surfaces in terms of their reflective properties.</td> <td></td> </tr> <tr> <td>Label a number of effects of reflection.</td> <td></td> <td></td> </tr> </tbody> </table>	Basic	Advancing	Deep	Observe light reflected from surfaces.	Experiment with light reflecting from a variety of different surfaces.	Always, sometimes or never? Dark surfaces do not reflect light as well as those that are light.	Describe the effect of light reflecting from surfaces.	Categorise surfaces in terms of their reflective properties.		Label a number of effects of reflection.			<p>Recognise that light from the Sun can be dangerous and that there are ways to protect your eyes.</p> <table border="0"> <thead> <tr> <th>Basic</th> <th>Advancing</th> <th>Deep</th> </tr> </thead> <tbody> <tr> <td>Name some safety rules to avoid damaging your eyes with light from the Sun.</td> <td>Apply your knowledge of safety rules to explain how to safely view a solar eclipse.</td> <td>Investigate different types of sunglasses and recommend the best type to protect your eyes from day to day sunlight. (teacher: reinforcing the point that it is still not safe to look at the sun even through sunglasses)</td> </tr> </tbody> </table> 	Basic	Advancing	Deep	Name some safety rules to avoid damaging your eyes with light from the Sun.	Apply your knowledge of safety rules to explain how to safely view a solar eclipse.	Investigate different types of sunglasses and recommend the best type to protect your eyes from day to day sunlight. (teacher: reinforcing the point that it is still not safe to look at the sun even through sunglasses)
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## End of Lower Key Stage 2 Age Related Expectations

Milestone indicator	Basic	Advancing	Deep
Recognise that light is required in order to see things and that dark is the absence of light.	<p><b>Observe</b> and <b>record</b> the effect of light in seeing things.</p> <p><b>Answer questions</b> about the effect of light on seeing.</p> <p><b>Describe</b> darkness.</p>	<p><b>Explain</b> the relationship between light and seeing.</p> <p><b>Experiment</b> with different levels of light on the visibility of different coloured objects.</p> <p><b>Explain</b> why it is important to dress in high visibility clothing in some situations.</p>	<p><b>Relate</b> your knowledge of the Earth's rotation in space to your understanding of light and dark.</p> <p><b>True or false:</b> The Sun is the only natural source of light in our solar system?</p>
Notice that light is reflected from surfaces.	<p><b>Observe</b> light reflected from surfaces.</p> <p><b>Describe</b> the effect of light reflecting from surfaces.</p> <p><b>Label</b> a number of effects of reflection.</p>	<p><b>Experiment with</b> light reflecting from a variety of different surfaces.</p> <p><b>Categorise</b> surfaces in terms of their reflective properties.</p>	<p><b>Always, sometimes or never:</b> Dark surfaces do not reflect light as well as those that are light?</p>
Recognise that light from the sun can be dangerous and that there are ways to protect ones eyes.	<p><b>Name</b> some safety rules to avoid damaging ones eyes with light from the sun.</p>	<p><b>Apply</b> your knowledge of safety rules to <b>explain</b> how to safely view a solar eclipse.</p>	<p><b>Investigate</b> different types of sunglasses and <b>recommend</b> the best type to protect ones eyes from day to day sunlight. (teacher: reinforcing the point that it is still not safe to look at the sun even through sunglasses)</p>
Recognise that shadows are formed when the light from a light source is blocked by a solid object.	<p><b>Observe</b> and <b>record</b> the effect of blocking light with solid objects.</p> <p><b>Name</b> the effect and <b>describe</b> what is happening.</p>	<p><b>Explain</b> why an umbrella is a useful practical example (<b>apply</b>) of shadows.</p> <p><b>Give examples</b> of other practical uses (<b>apply</b>) for shadows.</p>	<p><b>True or false:</b> night time is a shadow?</p>
Find patterns in the way that the size of shadows change.	<p><b>Observe</b> and <b>record</b> the length of shadows at different times of the day.</p> <p><b>Observe</b> and <b>record</b> how the size of shadows change when the source of light is moved closer or further away from the object causing the shadow.</p>	<p><b>Explain</b> why shadows change size.</p> <p><b>Predict</b> when shadows will take a particular shape. e.g. what will the shadow of a tree look like on a bright summer evening with the sun in a particular position?</p>	<p>What is the <b>relationship</b> between the height of a light source in relation to the object that is causing a shadow?</p>

**Year 6  
Light**

- 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

**Notes:**  
*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).*

**Key Vocabulary**

As for Year 3 - Light, plus straight lines, light rays

**Common Misconceptions**

- Some children may think:
- we see objects because light travels from our eyes to the object.

**Activities**

- Explore different ways to demonstrate that light travels in straight lines e.g. shining a torch down a bent and straight hose pipe, shining a torch through different shaped holes in card.
- Explore the uses of the behaviour of light, reflection and shadows, such as in periscope design, rear view mirrors and shadow puppets.

*TAPS practical assessments to be used at the end of each unit.*

**Possible Evidence**

- Can describe, with diagrams or models as appropriate, how light travels in straight lines either from sources or reflected from other objects into our eyes
- Can describe, with diagrams or models as appropriate, how light travels in straight lines past translucent or opaque objects to form a shadow of the same shape
- Can explain how evidence from enquiries shows that light travels in straight lines
- Can predict and explain, with diagrams or models as appropriate, how the path of light rays can be directed by reflection to be seen, e.g. the reflection in car rear view mirrors or in a periscope
- Can predict and explain, with diagrams or models as appropriate, how the shape of shadows can be varied






*Concept Cartoons' and 'Exit Cards' to be used at the end of lessons to assess understanding.*

## Upper Key Stage 2 Working Scientifically

- Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.

Children independently ask scientific questions. This may be stimulated by a scientific experience or involve asking further questions based on their developed understanding following an enquiry. Given a wide range of resources, the children decide for themselves how to gather evidence to answer a scientific question. They choose a type of enquiry to carry out and justify their choice. They recognise how secondary sources can be used to answer questions that cannot be answered through practical work. The children select from a range of practical resources to gather evidence to answer their questions. They carry out fair tests, recognising and controlling variables. They decide what observations or measurements to make over time and for how long. They look for patterns and relationships using a suitable sample.

### Proof of Progress (Working Towards, Age Related Expectation or Greater Depth)

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## End of Upper Key Stage 2 Age Related Expectations

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Understand that light appears to travel in straight lines.	<b>Draw</b> and <b>label</b> diagrams to show how light travels.	<b>Experiment</b> with ways that <b>demonstrate</b> how light travels. <b>Predict</b> where light will appear after hitting a reflective surface.	<b>Investigate</b> whether light can ever 'bend' around corners and present information on this. <b>Note :this is called diffraction.</b> Does blocking light prove that it travels? ( <b>reason, investigate</b> )
Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eyes.	<b>Draw</b> and <b>label</b> diagrams that show how objects are seen. <b>Observe</b> and <b>describe</b> how light diverges from a source.	<b>Experiment</b> with making or using a periscope to <b>demonstrate</b> how objects may be seen. <b>Explain</b> what is happening to the light.	<b>True or false:</b> light is invisible?
Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them, and to predict the size of shadows when the position of the light source changes.	<b>Draw</b> and <b>label</b> diagrams that show how shadows are formed and that the size of the shadow may be predicted when the position of the source of light changes. <b>Describe</b> how divergent light from a source affects the size of shadows.	<b>Explain</b> why shadows are 'longer' in the winter and 'shorter' in the summer. <b>Explain</b> why a shadow of an object may not appear to be the same shape as the object.	<b>Is it possible (reason)</b> that a shadow can be formed that is smaller than the object that created it?
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