

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)

Recognise that light is required in order to see things and that dark is the absence of light.

Basic

Observe and record the effect of light in seeing things.

Answer questions about the effect of light on seeing.

Describe darkness.



Advancing

Explain the relationship between light and seeing.

Experiment with the effect of different levels of light on the visibility of different coloured objects.

Explain why it is important to dress in high visibility clothing in some situations.

Deep

Relate your knowledge of the Earth's rotation in space to your understanding of light and dark.

True or false? The Sun is the only natural source of light in our solar system.

See an example on page 11

Notice that light is reflected from surfaces.

Basic

Observe light reflected from surfaces.

Describe the effect of light reflecting from surfaces.

Label a number of effects of reflection.



Advancing

Experiment with light reflecting from a variety of different surfaces.

Categorise surfaces in terms of their reflective properties.

Deep

Always, sometimes or never? Dark surfaces do not reflect light as well as those that are light.

Recognise that light from the Sun can be dangerous and that there are ways to protect your eyes.

Basic

Name some safety rules to avoid damaging your eyes with light from the Sun.



Advancing

Apply your knowledge of safety rules to explain how to safely view a solar eclipse.



Deep

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)

Recognise that shadows are formed when the light from a light source is blocked by a solid object.

Basic

Observe and record the effect of blocking light with solid objects.

Name the effect and describe what is happening.



Advancing

Explain why an umbrella is a useful practical example of shadows. (apply)

Give examples of other practical uses for shadows. (apply)

Deep

True or false? Night-time is a shadow.



Find patterns in the way that the size of a shadow changes.

Basic

Observe and record the length of shadows at different times of the day.

Observe and record how the size of a shadow changes when the source of light is moved closer or further away from the object causing the shadow.

Advancing

Explain why shadows change size.

Predict when shadows will take a particular shape (e.g. the shadow of a tree on a bright summer evening with the Sun in a particular position).

Deep

What is the relationship between the height of a light source and the object that is causing the shadow?

See an example on page 125



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>Observe and record the effect of light in seeing things.</p> <p>Answer questions about the effect of light on seeing.</p> <p>Describe darkness.</p>	<p>Explain the relationship between light and seeing.</p> <p>Experiment with different levels of light on the visibility of different coloured objects.</p> <p>Explain why it is important to dress in high visibility clothing in some situations.</p>	<p>Relate your knowledge of the Earth's rotation in space to your understanding of light and dark.</p> <p>True or false: The Sun is the only natural source of light in our solar system?</p>
Notice that light is reflected from surfaces.	<p>Observe light reflected from surfaces.</p> <p>Describe the effect of light reflecting from surfaces.</p> <p>Label a number of effects of reflection.</p>	<p>Experiment with light reflecting from a variety of different surfaces.</p> <p>Categorise surfaces in terms of their reflective properties.</p>	<p>Always, sometimes or never: 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>Name some safety rules to avoid damaging ones eyes with light from the sun.</p>	<p>Apply your knowledge of safety rules to explain how to safely view a solar eclipse.</p>	<p>Investigate different types of sunglasses and recommend 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>Observe and record the effect of blocking light with solid objects.</p> <p>Name the effect and describe what is happening.</p>	<p>Explain why an umbrella is a useful practical example (apply) of shadows.</p> <p>Give examples of other practical uses (apply) for shadows.</p>	<p>True or false: night time is a shadow?</p>
Find patterns in the way that the size of shadows change.	<p>Observe and record the length of shadows at different times of the day.</p> <p>Observe and record 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>Explain why shadows change size.</p> <p>Predict 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 relationship 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)

<p>Understand that light appears to travel in straight lines.</p> <div> <div> Basic Draw and label diagrams to show how light travels. </div> <div> Advancing Experiment with ways that demonstrate how light travels. Predict where light will appear after hitting a reflective surface. </div> <div> Deep Investigate whether light can ever 'bend' around corners* and present information on this. <small>* This is called diffraction.</small> Does blocking light prove that it travels? (reason, investigate) </div> </div> 	<p>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.</p> <div> <div> Basic Draw and label diagrams that show how objects are seen. Observe and describe how light diverges from a source. </div> <div> Advancing Experiment with making or using a periscope to demonstrate how objects may be seen. Explain what is happening to the light. </div> <div> Deep True or false: invisible. </div> </div> 	<p>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.</p> <div> <div> Basic Draw and label 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. Describe how divergent light from a source affects the size of shadows. </div> <div> Advancing Explain why shadows are 'longer' in the winter and 'shorter' in the summer. </div> <div> Deep Is it possible that a shadow can be formed that is smaller than the object that created it? (reason, investigate) </div> </div> 
<p>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.</p> <div> <div> Basic Draw and label diagrams to explain how we see. </div> <div> Advancing Explain and demonstrate why we cannot always see all of the Moon. </div> <div> Deep Investigate and present information on how objects, such as a stick, appear to bend when placed in water.* </div> </div> 		

End of Upper Key Stage 2 Age Related Expectations

Milestone indicator	Basic	Advancing	Deep
Understand that light appears to travel in straight lines.	Draw and label diagrams to show how light travels.	Experiment with ways that demonstrate how light travels. Predict where light will appear after hitting a reflective surface.	Investigate whether light can ever 'bend' around corners and present information on this. Note :this is called diffraction. Does blocking light prove that it travels? (reason, investigate)
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.	Draw and label diagrams that show how objects are seen. Observe and describe how light diverges from a source.	Experiment with making or using a periscope to demonstrate how objects may be seen. Explain what is happening to the light.	True or false: 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.	Draw and label 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. Describe how divergent light from a source affects the size of shadows.	Explain why shadows are 'longer' in the winter and 'shorter' in the summer. Explain why a shadow of an object may not appear to be the same shape as the object.	Is it possible (reason) that a shadow can be formed that is smaller than the object that created it?
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.	Draw and label diagrams to explain how we see.	Explain and demonstrate why we can not always see all of the Moon .	Investigate and present information on how objects, such as a stick, appear to bend when placed in water. Note: this is called refraction