

YEAR 3 UNIT 3: Mirror, Mirror (Light)

Enquiry Question: How do we see things?

Related units: Year 2 unit 2: Material monster - Why are materials suitable for different jobs?

Year 5 unit 1: Out of this World! – Why do we have night and day?

Unit overview

National Curriculum Link Year 3: Light

Although this topic build on prior knowledge of materials, it is the first time they have come across a topic on light. However, they already know that shadows are dark and are similar in shape to the object forming them; that scientists might explain something by using the sentence structure: 'I think....because....' They also know that mirrors are made from shiny materials and reflect light. During the topic, pupils will recognise that they need light in order to see things and that dark is the absence of light. They will notice that light is reflected from surface and recognise that light from the sun can be dangerous and that there are ways to protect their eyes. They will recognize that shadows are formed when the light from a light source is blocked by an opaque object and find patterns in the way that the size of shadows change. They will explore what happens when light reflects off a mirror or other reflective surfaces.

Scientific vocabulary

- Dull
- Shiny
- Reflect
- Observation
- Explanation
- Light source
- Shadow
- Transparent
- Translucent
- Opaque
- Description
- Coating
- Kaleidoscope
- Timeline

Working scientifically

- Looking for patterns in what happens to shadows then the light source moves
- Looking for patterns when the distance between the light source and the object changes
- Record observations and make sense of them
- Design and carry out a fair test

Assessment

1. Explain the difference between a shadow and a reflection
2. Explain what makes a shadow bigger or smaller
3. Name at least 5 different uses of mirrors
4. Describe what a reflection in the mirror looks like

Cross-curricular links

English:

- Plan and write up an investigation
- Write an explanation about how shadows are formed

Maths:

- Recording results in a table and interrogating the table

Teacher knowledge

Images are constructed in our brains based on very simple signals sent from our eyes. Sight involves very complex brain functions, and a huge percentage of our brains (the largest, in fact, of any brain function) is required for doing nothing other than recognising what's in front of us.

Electric light, flames, TV screens and the Sun are all sources of light. We see these because light travels from them into our eyes.

We see objects that are not the light source because the light source hits them, is reflected off and then travels to our eyes. Often the light has bounced (been reflected) off several objects before it enters our eyes.

Different materials reflect light by different amounts. Dull materials scatter light and do not reflect very well. Shiny objects, such as mirrors, reflect light extremely well. When light strikes a mirror, it is reflected at the same angle as it hits the mirror – we call these two angles the angles of incidence and reflection.

Scientists use the shorthand of straight lines to represent how light travels. This unit provides the opportunity for children to draw diagrams of how light is reflected off surfaces. In Year 3 it will suffice just to draw straight lines. High attainers can add one arrow to the centre of each line to show the direction of travel (which is a feature of Year 6 work).

Shadows are formed when some rays of light continue to travel in straight lines, while other rays are stopped by an object. They come in different shapes and sizes. Objects that don't let light through them – like you and me – are called opaque: these objects make dark shadows. Objects that let a little light through, like leaves and stained glass windows, are called translucent objects and they form shadows that are not as dark. Objects that let all or nearly all light through, such as water or clear plastic film, are called transparent. They can make a very faint shadow because they might block a little light, or no shadow at all if they let all the light through.

Children should learn that scientists work in many different ways. Teachers can wrongly give the impression that science is all about doing a fair test – that's why it is important to introduce children to other ways of working. Researching secondary sources and spotting trends is one way of doing this.

Mirrors have been known for many centuries. Their existence has been discovered in many continents. In earlier times they were made from polished metals and were very expensive. A major component of modern mirror-making is glass. Because glass is a poor reflector, it must be coated in order to make a mirror. The most appropriate materials for making metallic coatings are silver, gold and chrome. The earliest use of the mirror was of course just to look at yourself. In the Middle Ages European astronomers used mirrors to make telescopes that brought many advances in our knowledge of the planets and moons in the Solar System. Modern telescopes can contain very large mirrors. When the French King Louis XIV had the Hall of Mirrors built at the Palace of Versailles in the 17th century, the mirrors were extremely expensive and only made possible by the new techniques that had been developed in Venice. Today mirrors are easily mass-produced and have many uses.

Did you know?

- Supermarket security teams set up curved mirrors to see around corners.
- Telescopes use curved and flat mirrors to collect light from distant objects and reflect it into the eye of the observer.
- Daylight turns to darkness because the moon blocks the sun and creates a giant shadow on the Earth.
- Sundials use shadows to tell the time but aren't very accurate. They cannot tell the time at night. Find out more about how they work.
- When the Biami people of Papua New Guinea were first introduced to the mirror in the 1970s, they were terrified of it. Why do you think this was?

Common Misconceptions

- That only mirrors make reflections. In fact, you can see your reflection in many shiny materials.
- That all reflections in mirrors look lifelike. In fact, concave and convex mirrors distort images, making them look bigger or smaller.
- That the image in a mirror is on the surface. In fact, the mirror simply reflects light into your eyes.
- That shadows are not related to the object that causes them. In fact, every shadow must be cast by an object.
- That shadows are the reflections of objects. In fact they are caused when light is blocked.
- That shadows are dark light. In fact, they form because of the absence of light. No light is dark.
- That there is only one kind of mirror – the flat mirror. In fact, curved mirrors can be made that distort reflections – these are used in cars.
- That mirrors were first made in China. This is not true – the first ones were made in Anatolia, Turkey, in 6000 BC.

Resources

An enlightening clip about light sources: www.youtube.com/watch?v=ifAVp0VqN70

'The Light Sources' song: www.youtube.com/watch?v=Mztpcdc6YWI

A good source of mirror games: www.arvindguptatoys.com/arvindgupta/mirror.pdf

Some simple experiments with light: www.lovemyscience.com/cat_light.html

What causes a shadow?: www.youtube.com/watch?v=bl6k7rLFVfs

Interactive games and activity ideas: www.bbc.co.uk/schools/scienceclips/ages/7_8/light_shadows.shtml

Looking at materials and shadows: www.bbc.co.uk/learningzone/clips/how-do-diferentmaterials-afect-shadows/6663.html