

# Year 6 Science

## Unit 6F - How we see things

### ABOUT THE UNIT

In this unit children learn that mirrors and shiny surfaces alter the direction in which light travels and that when they see objects, light enters the eye. Children contrast reflection and shadow formation.

Experimental and investigative work focuses on:

- planning and carrying out a fair test
- making observations and measurements
- recognising when to repeat measurements
- presenting results in line graphs
- identifying patterns in data.

Work in this unit also offers opportunities for children to relate their understanding of light, reflection and shadow formation to everyday phenomena.

Visually impaired children will need particular support in this unit. They will be able to take part through careful use of residual vision, through their awareness that many light sources are also heat sources and through their sense of touch. It is important for teachers to help children to be sensitive to those who are visually impaired.

This unit takes approximately 6 hours.

### WHERE THE UNIT FITS IN

Builds on Unit 3F 'Light and shadows' and Unit 5E 'Earth, Sun and Moon'

#### Children need to:

- know that when light is blocked by some materials, shadows are formed
- be familiar with representing data in line graphs
- know how to make careful measurements of length.

Links to Unit 3C and art.

### VOCABULARY

In this unit children will have opportunities to use:

- words and phrases related to shadow formation and reflection  
*eg opaque, reflect, reflection, light beam, mirror, light travelling*
- expressions making generalisations about patterns in results
- descriptions and explanations involving a sequence of ideas.

### RESOURCES

- torches with powerful beams
- white card
- small mirrors
- selection of shiny/polished and unpolished/dull materials
- opaque objects for shadow formation
- metre sticks or tape measures

### EXPECTATIONS

#### at the end of this unit

*most children will:*

recognise that light travels from a source, that when it is blocked, a shadow is formed and when it hits a shiny surface, it is reflected; that light sources are seen when light from them enters the eyes; make careful measurements of shadows and represent these in a line graph

*some children will not have made so much progress and will:*

recognise that when light is blocked, a shadow is formed, and that reflections can be seen in shiny surfaces; make measurements and present these in a table

*some children will have progressed further and will also:*

explain the difference between shadow formation and reflection in terms of the path of light

LEARNING OBJECTIVES	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES	POINTS TO NOTE
CHILDREN SHOULD LEARN		CHILDREN	
<p>NC Sc 4.3 a, b</p>	<p><b>1 Introductory activities</b></p> <p>Review children's understanding of light and shadows by asking them to draw and annotate a diagram to show how a shadow is formed. Suggest children use terms <i>eg light source, opaque, travel, block</i>. Discuss children's diagrams with them, drawing attention to the idea of light travelling.</p>		<p>This activity is intended to help teachers find out what children know and understand about light and shadows. Teachers will need to take this into account in their short-term planning of later activities in this unit.</p>
<p>1. that light travels from a source 2. to use their knowledge about light to explain observations</p> <p>NC Sc 4.3 a, b</p>	<p><b>2 Light travels</b></p> <p>If appropriate, demonstrate to children or ask children to demonstrate to others that light travels <i>eg by shining a torch onto a wall and blocking the light half way using a piece of card</i>. Ask children to draw a diagram to explain what is happening.</p> <p>Belair Lesson 1 Developing Science 6: p 49 Letts Science Activity Book p 124</p>	<ul style="list-style-type: none"> <li>• explain <i>eg by drawing a diagram</i> that light travels from the torch to the wall and may be blocked by an opaque object</li> </ul>	

3. that we see light sources because light from the source enters our eyes

3a that we see objects that are not light sources only if light reflected or scattered from them enters our eyes

**NC**  
**Sc 4.3 d**

### 3 How we see things

Ask children to explain how they see the light from the torch. Prompt by showing small light sources in dark areas and asking *eg Why we can see them more clearly when they are switched on?* Help children to draw diagrams to show and explain what is happening.

Belair Lesson 2  
Developing Science 6: p 50  
Letts Science Activity Book p 125

- explain *eg by drawing a diagram* that they see the torch light when light from it enters their eyes

Children may need help in recognising that they see things when light enters their eyes rather than thinking they see things because light travels from their eyes.

4. that light from an object can be reflected by a mirror, the reflected light enters our eyes and we see the object

5. that the direction of a beam or ray of light travelling from a light source can be indicated by a straight line with an arrow

**NC**  
**Sc 1.2 e, h**  
**Sc 4.3 c, d**

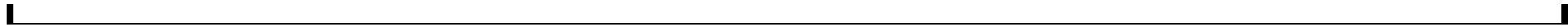
### 4 Reflections (1)

Ask children to explore what they can see with a mirror by posing questions *eg Can you see behind you? Can you make a beam of light move round the classroom?* Ask children to think of other questions to explore and to record and explain their observations in drawing and writing. Help children to represent the direction of a light beam using straight lines with arrows.

Belair Lesson 3  
Developing Science 6: p 51  
Letts Science Activity Book p126 - 127

- explain *eg using drawings* how mirrors can change the direction of a light beam, representing the direction in which the light beam travels by an arrow

<b>LEARNING OBJECTIVES</b> CHILDREN SHOULD LEARN	<b>POSSIBLE TEACHING ACTIVITIES</b>	<b>LEARNING OUTCOMES</b> CHILDREN	<b>POINTS TO NOTE</b>
<p>6. that when a beam of light is reflected from a surface, its direction changes</p> <p>7. to make careful observations and comparisons</p> <p><b>NC</b> <b>Sc 4.3 c</b></p>	<p><b>5 Reflections (2)</b></p> <p>Demonstrate to children, in a relatively dark area, what happens when a torch with a powerful beam is placed on a piece of white paper and shone at a mirror. Ask children to trace the path of the beam and of the reflected beam and to explore what happens when the light hits the mirror at different angles.</p> <p>With the children sitting in a semi-circle, use a table on its side, a tennis ball and a large mirror to demonstrate the angle of reflection from a mirror, and that it can be compared to the way a ball bounces off a wall.</p> <p>Belair Lesson 3 Developing Science 6: p 52</p>	<ul style="list-style-type: none"> <li>trace the path of the torch beam and explain that it is reflected from the mirror</li> <li>recognise <i>eg in drawings</i> that when the angle at which the light hits the mirror is changed, the path of the reflected light also alters</li> </ul>	<p>At this stage children do not need to know formally that the angle of incidence is equal to the angle of reflection.</p>
<p>8. that shiny surfaces reflect light better than dull surfaces</p> <p>9. to make and record comparisons of how different surfaces reflect light and to draw conclusions from the comparisons</p> <p><b>NC</b> <b>Sc 1.2 e - j</b></p>	<p><b>6 Reflectivity of different materials</b></p> <p>Present children with a collection of shiny and dull surfaces <i>eg mirrors, polished metals, perspex, paper, gloss and matt painted surfaces, polished wood</i>. Ask children to find out which ones they can see themselves in and which ones reflect a torch beam, to record their results and to draw conclusions from their results. Ask children to use their own knowledge and secondary sources to identify everyday uses of mirrors.</p> <p>Additional whole class activity: set up slide projector as constant light source shining into a black box at the end of which different samples can be placed. Record the reflected light reading from different materials using a light meter.</p> <p>Belair Lesson 4</p>	<ul style="list-style-type: none"> <li>produce a table of observations showing that shiny materials both reflect a torch beam and allow children to see themselves</li> <li>make a generalisation about shiny surfaces and reflection <i>eg polished surfaces reflect light better than other surfaces, shiny surfaces can be used as mirrors, dull surfaces cannot</i></li> </ul>	<p><b>SAFETY</b> – Make sure that mirrors etc do not have sharp edges.</p>



LEARNING OBJECTIVES	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES	POINTS TO NOTE
CHILDREN SHOULD LEARN		CHILDREN	
<p>10. to identify factors which might affect the size and position of the shadow of an object</p> <p>11. to investigate how changing one factor causes a shadow to change</p> <p>12. to consider trends in results and to decide whether there are results which do not fit the pattern</p> <p>13. to check measurements by repeating them</p>	<p><b>7 Shadow investigations</b></p> <p>Remind children of shadow formation using an opaque object <i>eg a cardboard figure</i>. Ask them to explore ways in which the shadow of the figure can be made to change. Ask children to suggest questions they could investigate <i>eg What happens to the size of the shadow when you move the figure nearer the light?</i> Help children to decide how to carry out the investigation, including deciding on the measurements they are going to take. Ask children to record results and help them to present them in a line graph. Talk with children about patterns in the results and, if necessary, encourage them to repeat measurements to check them.</p>	<ul style="list-style-type: none"> <li>• suggest questions which might be investigated <i>eg distance of object from screen, distance of object from light source, angle at which light source shines on object</i></li> <li>• show, in the investigation, that they changed one factor while keeping others the same</li> <li>• identify results which do not seem to fit the pattern and check these by repeating measurements</li> <li>• make a generalisation from the results <i>eg the nearer the figure was to the torch, the bigger the shadow</i></li> </ul>	<p>This activity offers children the opportunity to carry out a whole investigation. It may be helpful to concentrate on the aspects of investigation highlighted in the learning objectives.</p> <p>This type of investigation needs a point source of light to work well. Using a bare 1.5 V bulb overdriven at 3 V produces a bright light approximating to a point source.</p>
<p><b>NC</b> <b>Sc 1 most elements</b> <b>Sc 4.3 b</b></p>	<p>Belair Lesson 5 Developing Science 6: p 53 Letts Science Activity Book p 128 - 129</p>		

LEARNING OBJECTIVES	POSSIBLE TEACHING ACTIVITIES	LEARNING OUTCOMES	POINTS TO NOTE
CHILDREN SHOULD LEARN		CHILDREN	
<p>14. to recognise differences between shadows and 'reflections'</p> <p><b>NC</b> <b>Sc 4.3 a - d</b></p>	<p><b>8 Review and assessment</b></p> <p>Review work in this unit by asking children to suggest differences between shadows and images (reflections) seen in shiny surfaces.</p> <p>Belair Lesson 6 Developing Science 6: p 54 Letts Science Activity Book p 130 - 131</p> <p>+ Belair Test 6F for school records</p>	<ul style="list-style-type: none"> <li>• identify observable differences <i>eg my shadow is dark and I can only see my shape, when I look at myself in a mirror I can see my face, or opaque objects make shadows and you can see yourself in shiny surfaces</i></li> <li>• explain differences between shadows and reflections in terms of light <i>eg shadows are made when light is blocked, when light is reflected it changes direction when it hits a shiny surface</i></li> </ul>	<p>Children sometimes confuse shadows and reflections. It is important to clarify that children understand that reflection occurs when a light beam changes direction on hitting a surface. A shadow is formed when a light beam is blocked by an opaque object.</p>