



TEACHER'S NOTES

Science – Light and shadows (based on QCA Unit 3f)

Learning Intentions

In this unit pupils will learn about the relationship between light, an object and the formation of shadows. Pupils will observe the apparent movement of the Sun and the associated changes in shadows.

Pupils will be asked to:

- make and record measurements and observations;
- draw conclusions;
- suggest explanations for observations and conclusions.

SAFETY WARNING: NEVER look directly at the Sun!

Resources for further work

Torches with powerful beams, combs with widely spaced teeth, cardboard tubes, a selection of differently shaped objects, shadow sticks, metre sticks or tape measures, a compass, collection of opaque, transparent and translucent objects and materials (e.g. plastic bottles, fine gauze, thin nylon, wood, acetate, foils, greaseproof paper), a white cardboard screen, overhead projector.

Glossary / Vocabulary

axis	An imaginary line about which the Earth spins.
block	To make the movement of something difficult or impossible.
direction	The line along which something moves or points.
light	A type of energy that stimulates sight and makes things visible.
opaque	A material that does not let any light pass through it.
orbit	One complete circle around an object, e.g. the Earth orbits the Sun.
position	The place where something is located.
predict	To say that something will happen.
prediction	An expectation about what will happen.
shadow	An area of darkness formed when an object blocks the travel of light.
spin	A revolving or turning motion.
translucent	A material that lets some light pass through it, but is not see-through.
transparent	A material that lets almost all light pass through it and is see-through.



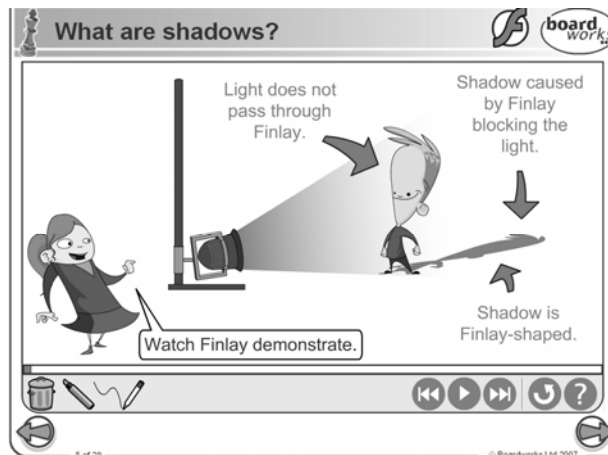
Lesson notes (sections 1 – 5)

1. What are shadows?

Learning Objectives

Pupils will learn:

- that shadows are formed when light travelling from a source is blocked;
 - to make and record observations and to present information in drawing and writing;
 - that shadows are formed when objects block light from the Sun;
 - that shadows are similar in shape to the objects forming them.
- Pupils can investigate how light travels in straight lines by getting a tube and looking at something through it. Then bend the tube. Now the light can't be seen.
 - Ask pupils what they notice about the shape of the shadow. They could experiment with other shaped objects blocking a light source to see if the shape of the shadow is always similar to the shape of the objects forming them.
 - Let children explore shadow formation using torches and objects of different shapes and sizes. Introduce children to the idea of light travelling from a source by shining a powerful torch beam through a comb with widely spaced teeth and showing that the beam is blocked and doesn't bend round corners. Show that a shadow is formed on a screen. Ask pupils to record what they see in drawings and writing.



Notes



2. Changing shadows

Learning Objectives

Pupils will learn:

- that shadows of objects in sunlight change over the course of the day;
 - to make and record observations of shadows and to try to explain these using knowledge about light;
 - that shadows change in length and position throughout the day;
 - to measure the length of the shadow in standard measures;
 - to make a table and bar chart to show how the length of the shadows changes during the day.
- This chapter focuses on the changes in **length** of the shadow. The next chapter *The Sun clock* focuses on the **direction** of the shadow and how its position and length relate to the apparent movement of the Sun across the sky.
 - **SAFETY WARNING:** Tell pupils never to look at the Sun directly as blindness can result.

Changing shadows

Late in the afternoon, the Sun is again low in the sky.
Does Lilly's shadow appear long or short?

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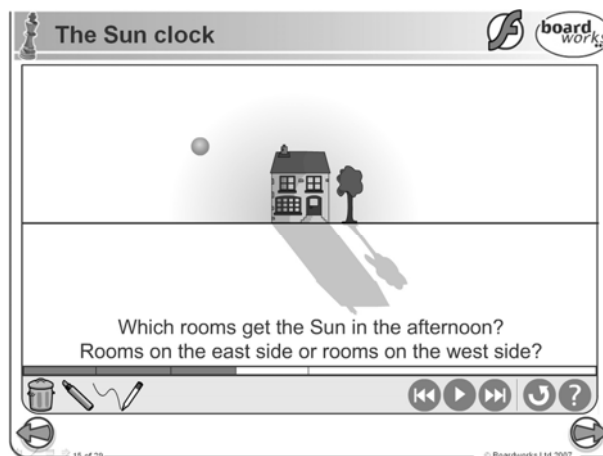


3. The Sun clock

Learning Objectives

Pupils will learn:

- to record and identify a pattern in the observations of the Sun;
 - that the Sun appears to move across the sky during the day;
 - that when the Sun is behind them their shadow is in front;
 - that the Sun appears to move across the sky in a regular way every day;
 - that the Sun appears highest in the sky at midday;
 - that the higher the Sun appears in the sky the shorter the shadow;
 - that the Sun does not move, its apparent movement is caused by the spinning of the Earth on its axis;
 - that shadows can be used to tell the approximate time of day.
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- Remind pupils of earlier work and ask them to think about whether the Sun shines into the classroom or room at home in the same place all through the day. Ask pupils whether the Sun follows the same pattern every day and suggest they observe it every sunny day over a period of two weeks. Ask them to think of a way of recording their observations e.g. by putting stickers on the window at the same time each day or by making sure an object is always in the sunlight. At the end of the period, question pupils about observations and whether the Sun appears to move in a regular way.
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- **SAFETY WARNING:** Tell pupils never to look at the Sun directly as blindness can result.



Notes




4. Opaque, translucent, transparent

Learning Objectives

Pupils will learn:

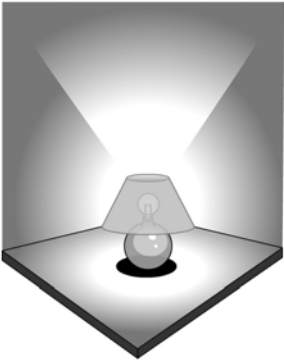
- that opaque objects/materials do not let light through and transparent objects/materials let a lot of light through;
 - to use their knowledge about light and shadows to predict which materials will form a shadow and to plan how to test this;
 - to compare the shadows formed by different materials and to draw conclusions from their results;
 - to decide whether the results support their predictions and to use knowledge about shadow formation to explain the conclusions.
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- Encourage pupils to make clear and descriptive predictions about whether an object will cast a shadow and what the shadow will look like (shape and colour). After all the objects' shadows have been revealed ask pupils to make generalisations e.g. opaque materials form dark shadows because they do not let any light through, and even transparent materials can make a faint shadow because they block some light.



Opaque, translucent and transparent 

Materials that let some light pass through them but are not see-through are called translucent.

Translucent materials block out some light, but not all of it.

This lampshade is made of a translucent material so the room is lit, but not too harshly.



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Notes



5. Review

- Review work on shadow formation and light by asking pupils to think of questions a younger child might ask and what answers they would give. Try out the questions and answers with the class.

Extension task / homework

- Ask pupils to create a puppet show and incorporate materials that are translucent, transparent and opaque. Which materials make the best shadows? Why?

Notes