Now You See Me, Now You Don't

How shadows form; observing the shape and position of shadows (*2 hours over the course of a day*)

Purpose of the lesson: for children to observe and describe the appearance of shadows, and to record how their shape changes during the course of a day.

National Curriculum Links

- **Sc1: 1a** that science is about thinking creatively to try to explain how living and non-living things work, and to establish links between causes and effects;
- **Sc1: 2c** think about what might happen or try things out when deciding what to do, what kind of evidence to collect, and what equipment and materials to use;
- **Sc1: 2h** use a wide range of methods, including diagrams, drawings and tables to communicate data in an appropriate and systematic manner;
- **Sc4: 3a** that light travels from a source;
- **Sc4: 3b** that light cannot pass through some materials, and how this leads to the formation of shadows.

Learning objectives

Children learn:

- that shadows are formed when objects block the passage of sunlight;
- that shadows are similar in shape to the objects forming them;
- that shadows of objects in sunlight change over the course of a day;
- how to make and record observations of shadows.

Learning outcomes

Children:

- state that shadows form when an object blocks out light;
- observe and explain that the shape of a shadow is similar to the shape of the object casting it;
- measure and observe that the length of shadows cast by the sun changes over the course of a day.

Vocabulary

light, dark, sun, sunshine, light source, opaque, shadow, length

Resources & preparation

- This lesson on shadows needs to be started as early as possible in the morning and revisited three or four times during the day. Time needs to be available towards the end of the afternoon for recording to be completed.
- A sunny day is essential for this lesson. You will need a large playground space and plenty of chalk. Clipboards (if available) could be used for out-of-doors recording work, although this is not essential.

Activity 1 Introduction - how shadows form

- Start the lesson by asking the children to explain to the person next to them how a shadow is formed. (Teaching point from **Lesson 1: Learning by torchlight**). Ask one or two children to explain to the class what the person next to them said. Then (re)draw a simple diagram showing how shadows form using relevant vocabulary; **light source, opaque, shadow, darkened area, lighter surrounding area**. Tell the children that today they are going to be observing their own shadows and finding out whether their shadows are the same at different times during the day.

Activity 2 Shadow game

- Take the children outside. Find as flat a playground area as possible and ask the children to look around and name objects/buildings which are making particular shadows. Ask the children what the source of light is which is being blocked out by the surrounding objects/buildings. (This is the Sun.)
- Tell the children that they are going to play a shadow game, and that all they have to do is follow the instructions which you will call out. Give the children a variety of quick activities such as:
  - ***Move into a space where you can see your shadow.***
  - ***Move into a space where you cannot see your shadow.***
  - ***Try and run away from your shadow***. (Teaching point – all objects on the ground are 'joined' to their shadows. Ask the children if they can think of anything which is not joined to its shadow, e.g. cloud, aeroplane, parachutist whilst in the air.)
  - ***Make your shadow T-shaped.***
  - ***Make your shadow O-shaped.***
  - ***Make your shadow Y-shaped.***
  - ***Make your shadow as large as possible.***
  - ***Make your shadow as small as possible.***
  - ***Try and 'catch' someone else's shadow.*** (Explain that if they get caught, the children have to form pairs, and then threes, until they catch a fourth person, so that they can break up into pairs again. Play this game until everyone is caught.)
  - ***Make your shadow shake hands with another shadow.***
  - ***In pairs, make an E-shaped shadow.***
  - ***Can two of you make a shadow the size of only one person?***
  - ***Can three of you make a shadow the size of only one person?***
  - ***Can four of you make a shadow the size of only one person?*** Etc.

- A camera or digital camera to take photos of children's work outside would be useful.
- Copies of **Resource Sheets 2.1**, **2.2**, and **2.3** – one for each child.
- **Resource Sheet 2.3** – see **Differentiation**.

Differentiation

- For less able children, **Resource Sheet 2.3** *More Shadows in the Playground* offers suggestions, with appropriate vocabulary, of what may happen to shadows during the course of a day. The children can tick or cross the options that they think will happen. They may also add any to the list, should they want to.
- It may not be appropriate to expect less able children to be able to try and explain why they think shadows will stay the same or change. This idea could be discussed futher after **Lessons 3** and **4**, when they will have had the opportunity to observe and measure both shadows and the movement of the sun over the course of a day.

Additional activities

- Reinforce the idea that the shape of a shadow is like the shape of the object that casts it by getting the children to use the projector to draw round one another's silhouettes. Ask them to create a 'Rogues' Gallery' with the accompanying caption: 'Can you guess who's who?'

Notes

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Activity 3 Drawing shadow outlines

- Gather the children together in the playground. Conclude the previous activity by asking the children to describe any similarities between the object that makes a shadow and the shadow itself. Answers may include comments about size and shape. Emphasise the fact that shadows are a similar shape to the objects that form them.
- Ask the children if they have ever noticed whether shadows change or remain the same over the course of a day. Accept all suggestions, e.g. 'stay the same during the day; stay in the same position but change in length; change position but stay the same length; stay in the same position but change shape; change position and change shape'.
- Tell the children that they are going to test their ideas to find out which ones are correct. They will do this by observing their shadows at various times during the day.
- Ask them to work in pairs to find a space on the playground where there is room for one child to stand, while his/her partner draws around the child's shadow and feet with some chalk. Drawing around feet will ensure that the children stand in the same position when they return to make measurements during the day. Tell the children to write their names in this first shadow outline.

Activity 4 Shadow predictions

- Back in class, make sure that all the children are clear about when they are going back outside to observe their shadows. (Two or three more visits would be ideal.) Then ask the children to complete the first section of **Resource Sheet 2.1** *Shadows in the Playground*. This asks the children to do two things:
  - write their prediction of what they think will happen to their shadow;
  - draw and label their prediction of what they think will happen to their shadow.
- Remind the children that their shadow always stayed 'joined' to their feet while they played their shadow game. Explain that their picture of what they think will happen to their shadow therefore needs to show three or four shadows, all radiating from the same spot, i.e. their feet. e.g.

- **Resource Sheet 2.1** asks the children to explain why they think their shadow will be as they have drawn it. Their explanations may give you an insight into the children's present knowledge prior to **Lessons 3** and **4**. These deal in greater detail with shadows and the apparent movement of the sun across the sky.

Activity 5 Revisiting shadows

- At allocated times during the day, return to the playground to draw subsequent shadow outlines. Remind the children to make sure that the same person's shadow is being drawn, and that they are standing in their original position. Encourage the children to describe any changes that may have taken place to their shadow (in terms of shape, length, or position). If possible, take photographs of this work, so that they can be used in the children's books or as part of a class display.

Activity 6 Reviewing predictions/observations

- When all observations have been completed, talk with the children about describing their shadows. Use comparative language to describe the changes that have taken place. Then ask the children to draw the final outlines of their shadows onto their resource sheets. If the weather allows, and clipboards are available, this could be done out of doors.
- **Resource Sheet 2.2** *True or False?* models and lists some summary statements that relate to the observations that children should have made. By each statement ask the children to write TRUE or FALSE, depending on whether the sentence describes what they observed.

Shadows in the Playground **Name:**

Resource Sheet 2.1

My predictions:

During the day I think that my shadow will:

This is what I predict my shadow will look like at different times during the day:

I think my shadow will look like this because:

This is how my shadow did look during the day:

True or False?

Name: _____

Resource Sheet 2.2

Things I noticed about my shadow during the day

(Write **True** or **False** next to each sentence.)

1. My shadow always stayed 'fixed' to me. ☐
2. My shadow was able to run away from me. ☐
3. My shadow was circular in shape. ☐
4. My shadow was roughly the same shape as me. ☐
5. My shadow stayed in the same position all day. ☐
6. My shadow moved during the morning, but did not move during the afternoon. ☐
7. My shadow did not move during the morning, but moved during the afternoon. ☐
8. My shadow moved during the morning and the afternoon. ☐
9. My shadow stayed the same length all day. ☐
10. My shadow did not stay the same length all day. ☐
11. My shadow changed length during the day. ☐
12. My shadow looked as if it became shorter than me. ☐
13. My shadow looked as if it became longer than me. ☐
14. My shadow became shorter than 30cm. ☐
15. I could make a shadow on the playground because my body blocked out light from the sun and stopped it from shining on to the surface of the playground. ☐

More Shadows in the Playground

Resource Sheet 2.3

Name:

My predictions:

During the day I think that my shadow will:

Stay the same	Change position	Get longer	Get shorter	Get longer then shorter	Get shorter then longer

This is what I think my shadow will look like at different times during the day:

I think my shadow will look like this because...

This is how my shadow did look during the day: