How Big Is It Really? Shadows and Patterns

Teacher		**Class**	Year 3
Subject	Science	**Topic**	Light and shadows
Date		**Room**	
Lesson length	60 minutes	**Country**	United States

Pupils learn how opaque objects block light to make shadows. They measure toy shadows to prove close light makes big shadows.

Curriculum links

- recognise that shadows are formed when the light from a light source is blocked by an opaque object [1]
- find patterns in the way that the size of shadows change [1]

Learning objectives

- Students will recognise how an opaque object blocks light to form a shadow.
- Students will measure shadows and describe the pattern as distance changes.

Success criteria

- I can explain how an opaque object makes a shadow.
- I can measure shadow height in centimetres accurately.
- I can describe the big-close and small-far shadow pattern.

What students already know

Dim lights, shine torch on wall. Ask: When do you see your shadow outside and what was blocking the light? Take 3 quick ideas.

Key words

light source	something that makes its own light, like the Sun or a torch [5]
opaque	material that lets no light pass through it [3]
shadow	dark shape left where light is stopped by something blocking it [1]
measure	use a ruler to find how tall or long something is in centimetres [1]
pattern	something that happens again in the same way so you can predict it [1]

Materials

- torches with working batteries, one per pair
- toy bricks, one per pair
- white paper, sticky tape, pencils, rulers in centimetres
- printed shadow table with rows for 10 cm, 20 cm and 30 cm
- printed Worksheet Tasks A, C and E, one per pupil
- projector, wall screen and Slides 1-2, 4, 6-7, 9-12

Before the lesson

- Print Worksheet Tasks A, C and E and the shadow table with picture boxes for numbers.
- Test Video clip 1 on Slide 6 for sound and picture and queue to 0:00.
- Fix white paper screens to wall, check torches, pre-mark 10 cm, 20 cm and 30 cm spots with tape.
- Darken one corner of the room for clear torch shadows.

Created with LessonDino.com · AI lesson planner with checkable sources

Lesson outline

0–5 min **Starter** 5 min · Whole class

Recall seeing shadows outside and hook pupils with measuring to prove what makes shadows grow.

YOU DO

1. Show Slide 1 title and say the hook question to the class.
2. Show Slide 2 question and give 30 seconds think time.
3. Take paired whisper, then ask two pairs to share when they see shadows.
4. Link answers to today's measuring job and today's learning goals.

STUDENTS DO

1. Think about when they see their own shadow outside.
2. Whisper idea to partner, then share with class.

Say: Scientists measure, they do not just guess. Can we prove what makes shadows grow? Today we will test and measure shadows to find the pattern.

Ask: When do you see your shadow outside? (On a sunny bright day when the Sun lights us up.) · Where does the light come from and where is your shadow? (Light comes from the Sun, shadow is behind us on the opposite side.)

Check understanding: Hands up for who has seen a long shadow. If few respond, show your own arm shadow with the torch quickly.

Support: Let pupils point to Sun and shadow first, then copy: I see my shadow when it is sunny. **Stretch:** Ask: Why do you not see a clear shadow on a very cloudy day?

Use: Slides 1-2

5–17 min **Teaching** 12 min · Whole class

Teach how an opaque object blocks light to make a shadow.

YOU DO

1. Show Slide 4 chain and model torch on wall with hand blocking the beam.
2. Play Video clip 1 and ask pupils to spot what blocks light and listen for opaque.
3. Show Slide 7 points and test cardboard, clear plastic lid and tracing paper in the beam.
4. Model Worksheet Task A ordering, then pupils number steps 1 to 4 on their own sheet.

STUDENTS DO

1. Watch demo and video and call out what blocks the light.
2. Compare cardboard, clear plastic and tracing paper shadows.
3. Number Task A steps 1 to 4 to show how a shadow forms.

Say: A shadow is formed when the light from a light source is blocked by an opaque object [1]. Opaque means no light can pass through [3]. Clear glass lets light through, so almost no shadow [3].

Worked example: Order for Task A solved: 1 Light leaves a light source. 2 Opaque toy blocks the light. 3 Blocked light leaves a dark shape. 4 Shadow shows on surface behind.

Ask: Which material made a dark shadow and why? (Cardboard, because it is opaque and blocks the torch light [1].) · Why did the clear plastic make almost no shadow? (It is transparent, light completely passes through it [3].)

Check understanding: Hold up Task A sheets to show order 1-2-3-4. Re-teach chain with hand demo if order is mixed.

Support: Give sentence frame: The shadow formed because the cardboard blocked the light. **Stretch:** Ask pupils to predict two layers of tracing paper before testing, then explain change.

Use: Slides 4, 6-7, Video clip 1 (0:00–4:14), Worksheet Task A

Created with LessonDino.com · AI lesson planner with checkable sources

17–42 min **Main activity** 25 min · Pairs

Measure shadow size at different distances to find the close-big and far-small pattern.

YOU DO

1. Show Slide 9 task and fix torch in place pointing at white paper.
2. Model holding brick at 10 cm mark, measuring shadow height in centimetres and recording it.
3. Send pairs to test 10 cm, 20 cm and 30 cm, keeping torch still and brick straight.
4. Stop halfway to check tables, then prompt Worksheet Task C about torch moving closer.

STUDENTS DO

1. Take turns as holder and measurer at 10 cm, 20 cm and 30 cm.
2. Measure shadow height with ruler and record three numbers in table.
3. Complete Task C wheel: say what happens when torch moves closer to toy.

Say: Shine the torch at the toy in front of white paper. Keep the torch still. Move the toy to 10, 20 and 30 centimetres. If the object is close to the light it makes a bigger shadow because the light spreads out more before it reaches the screen [3].

Worked example: Fixed torch test solved: Brick at 10 cm, shadow 14 cm tall. Move to 20 cm, shadow 9 cm tall. Move to 30 cm, shadow 6 cm tall. Biggest shadow is at 10 cm, so closer means bigger.

Ask: Which distance gave the biggest shadow? (10 cm, closest to the light, it blocks more light [3].) · What happens if the object is further away from the light source? (The shadow is smaller because it blocks less light [3].)

Check understanding: Walk round with visualiser showing two tables. If measurements go wrong way, check torch moved or ruler read from wrong end.

Support: Use pre-marked 10 cm, 20 cm and 30 cm spots and picture table with boxes for numbers. **Stretch:** Predict shadow size at 40 cm before measuring, then test it.

Use: Slide 9, Worksheet Task C

42–50 min **Pattern talk** 8 min · Whole class

Agree and say the pattern in how shadow size changes with distance.

YOU DO

1. Collect three pairs of results on the board from near to far.
2. Show Slide 10 bullets and read each pattern line together.
3. Demo sliding toy near and far once more to match the numbers.
4. Ask pupils to say the pattern sentence to a partner.

STUDENTS DO

1. Call out their three measurements and compare with class.
2. Repeat pattern sentences and point to light-side and shadow-side.

Say: Close light equals big shadow, as the light spreads out more [3]. Far light equals small shadow, as the light spreads out less [3]. The shadow sits behind the toy, away from the light [3].

Ask: What is the pattern when we move the toy away? (The shadow gets smaller each time.) · Where does the shadow always sit? (Behind the toy, on the opposite side from the light [3].)

Check understanding: Mini whiteboards: write Close = ? and Far = ?. Correct to big and small if needed.

Support: Point to near and far tape marks while saying big and small. **Stretch:** Explain how to make a shadow twice as tall as the toy and freeze to show it.

Use: Slide 10

Created with LessonDino.com · AI lesson planner with checkable sources

50–60 min **Plenary** 10 min · Whole class

Check both goals and reflect on how ideas about shadows changed.

YOU DO

1. Show Slide 11 vote and take quick class vote on best shadow theatre place.
2. Show Slide 12 exit lines and model one answer about near light.
3. Give Worksheet Task E time to write I used to think... now I think...
4. Collect two ideas and link back to opaque block and size pattern.

STUDENTS DO

1. Vote for dark corner, window or midday and give reason.
2. Write Task E reflection and Slide 12 exit sentences on their own.

Say: Today we proved opaque toys block torch light and make shadows. We also proved close makes big and far makes small. Finish your exit sentences to show what you learnt.

Worked example: Exit model: One thing I learnt is an opaque brick blocks light to make a shadow. Near light makes a shadow big and tall.

Ask: Where is best for our puppet show and why? (Dark corner with torches, so shadows are clear and bright light is controlled.) · Near light makes a shadow what? (Big, because the light spreads out more before it reaches the screen [3].)

Check understanding: Read exit lines as tickets out. If pattern is missing, show near-far demo again before dismissal.

Support: Offer starter: I used to think shadows... Now I think shadows form when... **Stretch:** Add one question I still have about shadows to investigate next time.

Use: Slides 11-12, Worksheet Task E

Common mistakes

Mistake	How to spot it	How to fix it
Thinks clear plastic or glass makes a dark shadow.	Sorts transparent objects into shadow-maker pile.	Retest with torch: transparent lets light completely through, so almost no shadow [3].
Thinks shadow can move or stay on its own.	Says shadow follows or moves without object or light moving.	Freeze test: if both light and object stay still then shadow stays still too [3].
Thinks only object size sets shadow size.	Says big toy always means big shadow whatever the distance.	Compare same brick at 10 cm and 30 cm: further away gives smaller shadow [3].

Support

- Give pre-cut large shapes and sentence frame: The shadow formed because the ___ blocked the light.
- Use pre-marked 10 cm, 20 cm and 30 cm spots and a picture table with boxes for numbers.

Stretch

- Predict what two layers of tracing paper will do, then test and explain.
- Predict shadow size at 40 cm before measuring, then test it.

For the LSE or teaching assistant

Stay with target pairs in main activity: hold torch steady, help line ruler at zero, read cm together and prompt pattern language big-close, small-far.

Created with LessonDino.com · AI lesson planner with checkable sources

Check for understanding

Question	Answer
How is a shadow made?	Opaque object blocks light from a light source [1].
Toy at 10 cm makes a 14 cm shadow, at 30 cm makes a 6 cm shadow. What is the pattern?	Closer to light makes bigger shadow; further away makes smaller shadow [3].
Clear plastic in the torch beam: dark shadow or almost no shadow?	Almost no shadow because light passes through [3].

Homework

Draw your shadow in the morning and at midday and label which is longer.

Sources

1. National curriculum in England: science programmes of study · gov.uk · https://www.gov.uk/government/publications/national-curriculum-in-england-science-programmes-of-study/national-curriculum-in-england-science-programmes-of-study
2. Curriculum Map: Science Year 3 - camrose.harrow.sch.uk · camrose.harrow.sch.uk · https://www.camrose.harrow.sch.uk/_site/data/files/year-three/Curriculum%20Map%20Year%203%20Science.pdf
3. Light and shadows - KS2 Science curriculum - BBC Bitesize · bbc.co.uk · https://www.bbc.co.uk/bitesize/articles/z9wm7yc
4. Light and Shadows: Year 3 Science Project | Cornerstones · cornerstoneseducation.co.uk · https://cornerstoneseducation.co.uk/projects/light-and-shadows/
5. Light and Shadow - School Learning Zone · school-learningzone.co.uk · https://school-learningzone.co.uk/key_stage_two/ks2_science/light__sound_and_electricity/light_and_shadow/light_and_shadow.html
6. Year 3 Science: Light - Lights and Shadows | Hamilton Brookes · hamilton-trust.org.uk · https://www.hamilton-trust.org.uk/science/year-3-science/light-light-and-shadows/
7. Light and Shadows (Year 6) | CGP+ Primary Online - CGP Plus · cgpplus.co.uk · https://www.cgpplus.co.uk/primary/ks2/science/s2pac1398-light-and-shadows-year-6
8. Using Light and Shadow in Portrait Photography to Shape Emotion and ... · bamfordphoto.co.uk · https://bamfordphoto.co.uk/using-light-and-shadow-in-portrait-photography/
9. Light and Colour Primary Resource - National Geographic Kids · natgeokids.com · https://www.natgeokids.com/nz/primary-resource/light-and-colour-primary-resource/
10. Light - KS2 Science - BBC Bitesize · bbc.co.uk · https://www.bbc.co.uk/bitesize/topics/z3nnb9q
11. The Science of Light and Shadows | Science in Pre-K · scienceinprek.si.edu · https://scienceinprek.si.edu/science-light-and-shadows
12. Shadow Facts for Kids · kids.kiddle.co · https://kids.kiddle.co/Shadow
13. Light and shadows - Science Learning Hub · sciencelearn.org.nz · https://www.sciencelearn.org.nz/resources/2771-light-and-shadows
14. Light and Shadows Explained for Kids: Story, Facts & Activities | Storypie · mystorypie.com · https://mystorypie.com/learn/en/concept/light-and-shadows/
15. Light and Shadows | Kindergarten Science for Kids · kidsworldfun.com · https://www.kidsworldfun.com/learn-science/kindergarten/light-and-shadows.php
16. Learning Video: Light and Shadows - Kids Academy · kidsacademy.mobi · https://www.kidsacademy.mobi/video/v_science_grade1_u1_ch1l4_shadows/
17. Helping Children Understand Light and Shadows | KS2 Science · hands-oneducation.com · https://hands-oneducation.com/curriculum/articles/helping-children-understand-light-and-shadows.html
18. Light and Shadows Flashcards - Class 3 Year 3 Science IGCSE (Cambridge) · edurev.in · https://edurev.in/f/406459/Flashcards-Light-and-Shadows