



Support Resources

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**Llywodraeth Cymru
Welsh Government**

Show Summary

Pupils enter the unique learning environment of Techniquest's mobile dome to investigate the wonders of light. This show explores the real life uses of light, including reflectors, road markers and signs, and light reactive lenses for glasses. Through open questioning and exploration, pupils build on their own experiences of light to develop their knowledge and understanding. Pupils explore reflections, how mirrorballs can create a fantastic light effect, UV light, shadows and how light can be split with a prism.



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Skills Development

The activities in the workshop and these support resources feature the following skills:



Careers and the
World of Work



Curriculum
Cymreig



Developing
Communication



Developing
Number



Developing
Thinking



Personal Social
Education

Acknowledgements

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During this activity, pupils will investigate light and shadows. Their investigation will allow them to look at different factors that can affect shadows with the creation and use of shadow puppets.

What you need:

- Black Card
- Lollipop sticks or other rods
- Sticky tape
- Scissors
- Paper fasteners
- Screen of light material
- Torch

What you do:

- Draw the outline of your puppet on a piece of card. If you want your puppet to move then remember to draw these separately. Remember that all the detail needs to be cut out.
- With scissors, cut out your shape. If your puppet is going to move then you can also cut out limbs, tails or jaws and attach these with paper fasteners.
- With sticky tape attach the lollipop stick to the back of your puppet. If you have added limbs then you will need to add extra rods so that these can move too.
- Set up your theatre.

- Hang the sheet so that there is room behind it. Set up the torch so that it shines onto the sheet from behind and dim the lights.
- Now, with their puppets, a couple of people can sit close to the sheet with the light shining on it and be able to play with their puppets. The other people in the class can now see the puppets silhouette. Take it in turns until everyone has been able to show their shadow puppet in action.

Try and answer these questions:

- What do you think would happen if you changed the size of your puppet?
- What do you think would happen if you changed the light source?
- What do you need to make a shadow?
- Does your shadow change over the day? Why do you think this?



TASC Wheel

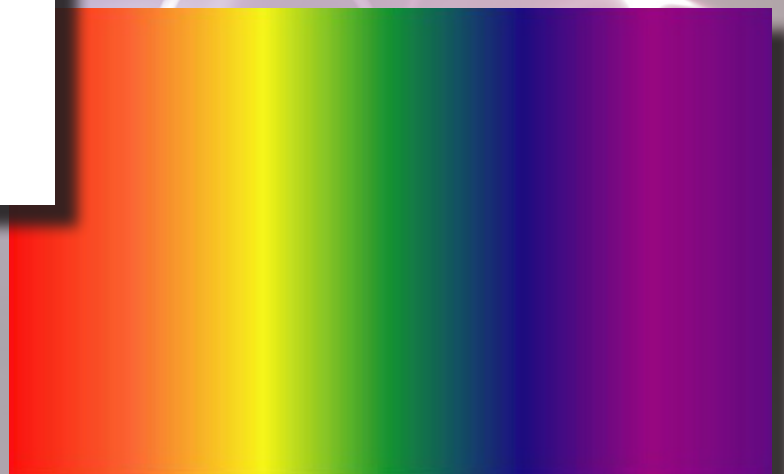
Thinking Actively
in a Social Context



Challenge

James and Megan were playing with prisms. They were both shining torches when Megan noticed that the light changed when it passed through the prism. She said, "When the white light comes out of the other side of the prism it splits into lots of different colours." James thought about this for a while and asked, "If we shine the different colours through another prism will the green split into yellow and blue, or the orange into yellow and red?"

- Explore James' question and investigate prisms.
- What happens when you try to pass light through other shapes and materials?
- Present your findings.



Gather/Organise

This is the starting point for the activity. Pupils assimilate all their knowledge about the topic into their working memory. At this stage it is possible to identify what pupils already know and any gaps in their knowledge. It is also possible to begin differentiating between pupils.

Questions to ask pupils at this stage include:

- What do you know about this?
- Where have you met this before?
- What information do you have?
- How much do you understand?
- What questions do you need to ask?

Identify

Pupils explore their understanding of the task to make sure they know what is required of them. Pupils can also set the success criteria for the activity at this stage.

Questions to ask pupils at this stage include:

- What is the task?
- What are your goals?
- What are your obstacles?
- What do you need to know?
- What do you need to do this?

Generate

This is a creative and open-ended stage. Pupils may engage in brainstorming. Here all ideas about how to approach the task are valid.

Questions to ask pupils at this stage include:

- How many ideas can you find?
- Who can help you?
- Where can you find out more?
- What do other people think?
- Is there another way?

Decide

This is a logical, rational, left-brained process, in contrast to the previous stage. Pupils consider time constraints, available resources, health and safety, as well as whether the idea fulfils the brief, when making decisions.

Questions to ask pupils at this stage include:

- Which ideas are important?
- Which is the best idea?
- What will happen if...?
- What is your plan?
- What else do you need to do?

Implement

Pupils test their idea in an attempt to fulfil the criteria for the task. Teamwork is key to their success at this stage. Pupils may work to a structured plan. The focus for this stage is 'maximum thinking, minimum recording'. This stage is all about developing thinking.

Questions to ask pupils at this stage include:

- How do you do it?
- How do you check your progress?
- Are you doing it correctly?
- Is your plan working?
- What do you do next?

Evaluate

Pupils should be realistic about their achievements and identify the next steps for improvement. Self and peer evaluation are key elements of this process.

Questions to ask pupils at this stage include:

- What have you done?
- How well did you do?
- How could you do better?
- Did you solve the problem?
- Did you work well in your group?

Communicate

Pupils present their findings to an audience; this could be within the class, the school or beyond. This stage can increase the pupils' motivation and engagement.

Questions to ask pupils at this stage include:

- Who will you tell?
- How will you tell or present?
- What will you say?
- How will you explain?
- How will you interest others?

Learn from Experience

This final stage focuses on metacognition; this is 'thinking about thinking'. In this stage pupils reflect on and discuss their learning. This stage can significantly enhance the impact of the learning experiences.

Questions to ask pupils at this stage include:

- What have you learned?
- How have you changed?
- What do you think and feel now?
- How can you use what you have learnt?
- How would you use this again?



Concept Photos

These 'concept photos' have been developed to promote discussion and to stimulate scientific thinking. They show different people discussing an everyday situation and presenting alternative explanations for what can be observed. Because of this, they are a good tool for demonstrating real life applications of science. Each concept photo shows one of Techniquest's exhibits or an everyday situation linked to the science-based topic. Open questions can be used to stimulate thinking and discussion. All pupils' ideas and points of view should be treated equally.

Developing your own images

To do this:

- Use everyday contexts that pupils are familiar with.
- Provide three or four alternative statements for discussion.
- Use positive rather than negative statements.
- Refer to research on common pupil misconceptions for guidance on statements.
- Include the scientifically acceptable viewpoint.

Photo 1

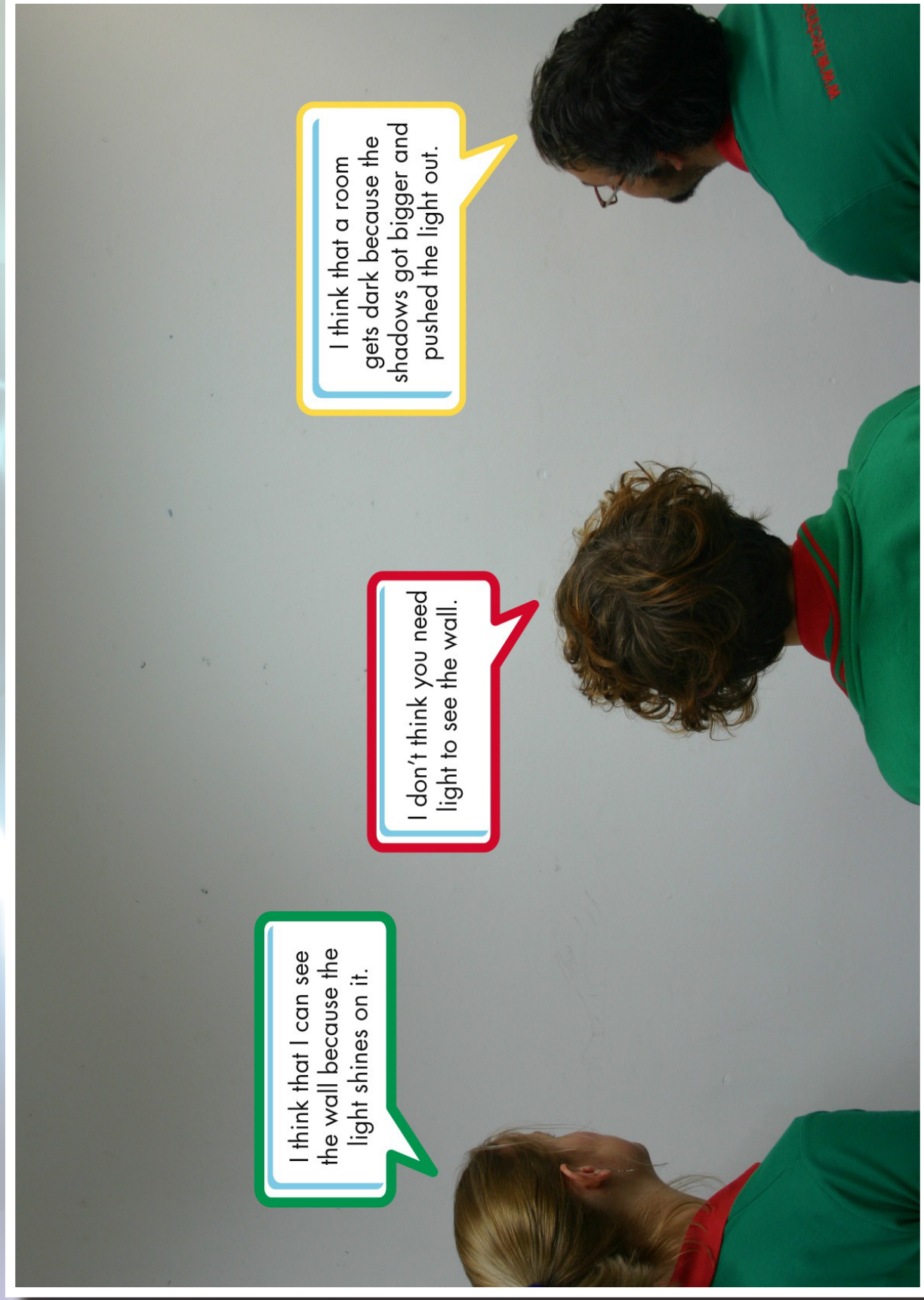
The following questions can be used:

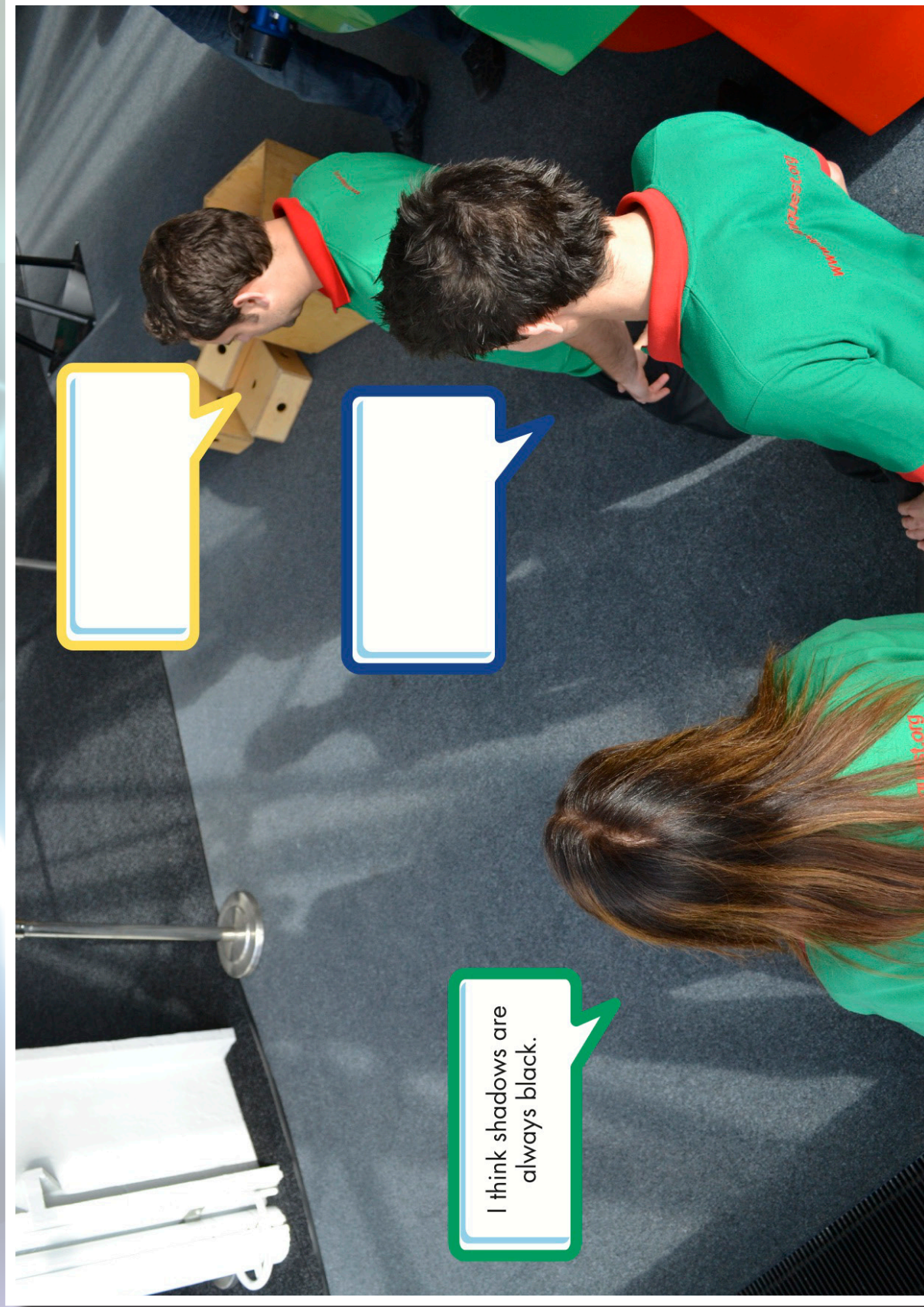
- Do you agree with any of the people in the picture? Who? Why?
- Do you disagree with any of the people in the picture? Who? Why?
- Can you think of any other explanations that are not included here?
- How can we find out which point of view is the most suitable?
- Is it possible that more than one point of view is suitable here?
- Why do you think different pupils have different points of view?

Photo 2

For this activity, only one of the speech bubbles has been filled in. The following open questions can be used:

- Do you agree or disagree with this statement? Why?
- Can you think of any other explanations that are not included here? These should be filled in on the image.
- Now we have some explanations, which do you agree or disagree with? Why?
- Is it possible that more than one point of view is suitable here?





Curriculum Links:

Range

How Things Work

Pupils are given opportunities to study:

- How light travels and how this can be used.

The Sustainable Earth

Pupils are also given some opportunities to study:

- A comparison of the features and properties of some natural and made materials.
- The properties of materials relating to their uses (magnetic, non-magnetic, rough, smooth).

Skills

Communication

Pupils are given opportunities to:

- Communicate clearly by speech, writing, drawings, diagrams, charts, tables, bar charts, line graphs, videos, and ICT packages, using relevant scientific vocabulary.

Enquiry Planning

Pupils decide upon and give some justification for each of the following:

- The choice of success criteria.
- Predictions using some previous knowledge and understanding.
- Where and how to find relevant information and ideas when carrying out a fair test, the key variables that need to be controlled and how to change the independent variable whilst keeping other key variables the same.

- The observations or measurements that need to be made.
- The equipment and techniques required for the enquiry.
- Any hazards and risks to themselves and others.

Developing

Pupils are given opportunities to:

- Use apparatus and equipment correctly and safely.
- Check observations and measurements by repeating them in order to collect reliable data.
- Make comparisons and identify and describe trends or patterns in data and information.
- Use some prior knowledge to explain links between cause and effect when concluding.
- Form considered opinions and make informed decisions.

Reflecting

Pupils think about what they have done in order to consolidate learning and transfer skills by:

- Beginning to evaluate outcomes against success criteria.
- Deciding whether the approach/method was successful.
- Describing how they have learned and identifying the ways that worked the best.
- Linking the learning to similar situations, within and outside school.

Developing Thinking

Plan

- Asking questions.
- Activating prior skills, knowledge and understanding.
- Gathering information.
- Determining the process/method and strategy.
- Determining success criteria.

Develop

- Generating and developing ideas.
- Valuing errors and unexpected outcomes.
- Entrepreneurial thinking.
- Thinking about cause and effect and making inferences.
- Thinking logically and seeking patterns.
- Considering evidence, information and ideas.
- Forming opinions and making decisions.
- Monitoring progress.

Reflect

- Reviewing outcomes and success criteria.
- Reviewing the process/method.
- Evaluate own learning and thinking.
- Linking and lateral thinking.

Developing ICT

ICT Skills Framework

- Finding and developing information and ideas.
- Creating and presenting information and ideas.

Developing Communication

Oracy

- Developing information and ideas.
- Presenting information and ideas.

Reading

- Locating, selecting and using information.
- Using reading strategies.
- Responding to what has been read.

Writing

- Organising ideas and information.
- Writing accurately.

Wider Communication Skills

- Communicating ideas and emotions.
- Communicating information.

Developing Number

Use Mathematical Information

- Using numbers.
- Measuring.
- Gathering information.

Calculate

- Using the number system.
- Using a variety of methods.

Interpret and Present Findings

- Talking about and explaining work.
- Comparing data.
- Recording and interpreting data and presenting findings.

Key

- Main focus
- No intended focus
- Incidental focus