



Support Resources

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Llywodraeth Cymru
Welsh Government

Summary

The session has two parts:

- 30-minute science theatre show – pupils participate in an interactive science theatre show exploring light, including how light travels, shadows and darkness. At the end of the show, pupils are asked to identify the key words used in the show.
- 30 minutes exploring the exhibition – pupils are challenged to investigate the exhibition and identify items within it that demonstrate the key words used in the first part of the show. Teachers are given cameras to take photos of the pupils' investigations.



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Skills Development

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



Developing
Communication



Developing
Number



Developing
Thinking



Personal Social
Education

Over the page are tips for making the most of the photographs taken by your pupils during their visit to Techniquest. There are also 12 photographs of Techniquest staff within the exhibition for your use. These include information about the key concepts shown.



Pupils should select one photograph from those taken during the visit. They should explain which key concepts from the show the photograph shows and how to the rest of the class. Pupils should compare their chosen photographs.

Pupils should select one exhibit that they really enjoyed using during their visit. They should then create a picture of it and challenge pupils to identify which key concept from the show it demonstrates and how.

Give each group a camera and one of the key concepts. Challenge pupils to explore the school and find examples of their key concept and photograph it. Pupils can then make a presentation for the rest of the class.

Challenge the pupils to explore the school, inside and outside, to find as many examples as possible of the key concepts. For an added challenge, set a time limit of 5 minutes. Pupils should then discuss their lists with the rest of the class.

Sample Questions

Who took this photograph?

What is this a photograph of?

Which key word are you showing in this photograph?

How are you showing this key word?

Are there any other key words that could be used to describe this photograph?

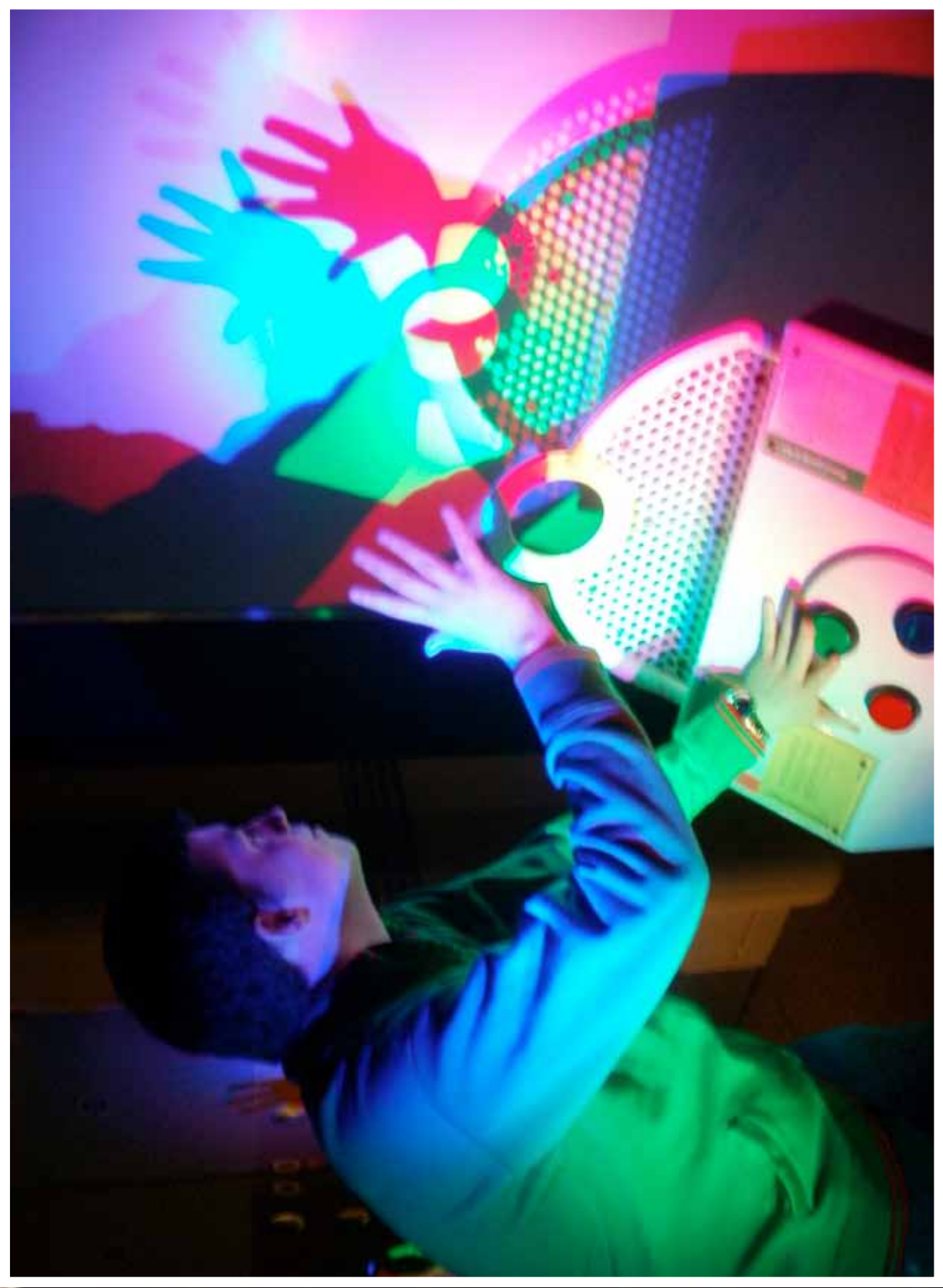
Has anyone else taken a photograph of this to show this key word?

Can you see anything in this room that would show this key word?

How does the photograph show the key word?

What else could you have taken a photograph of to show this key word?

What other key words could this photograph show?







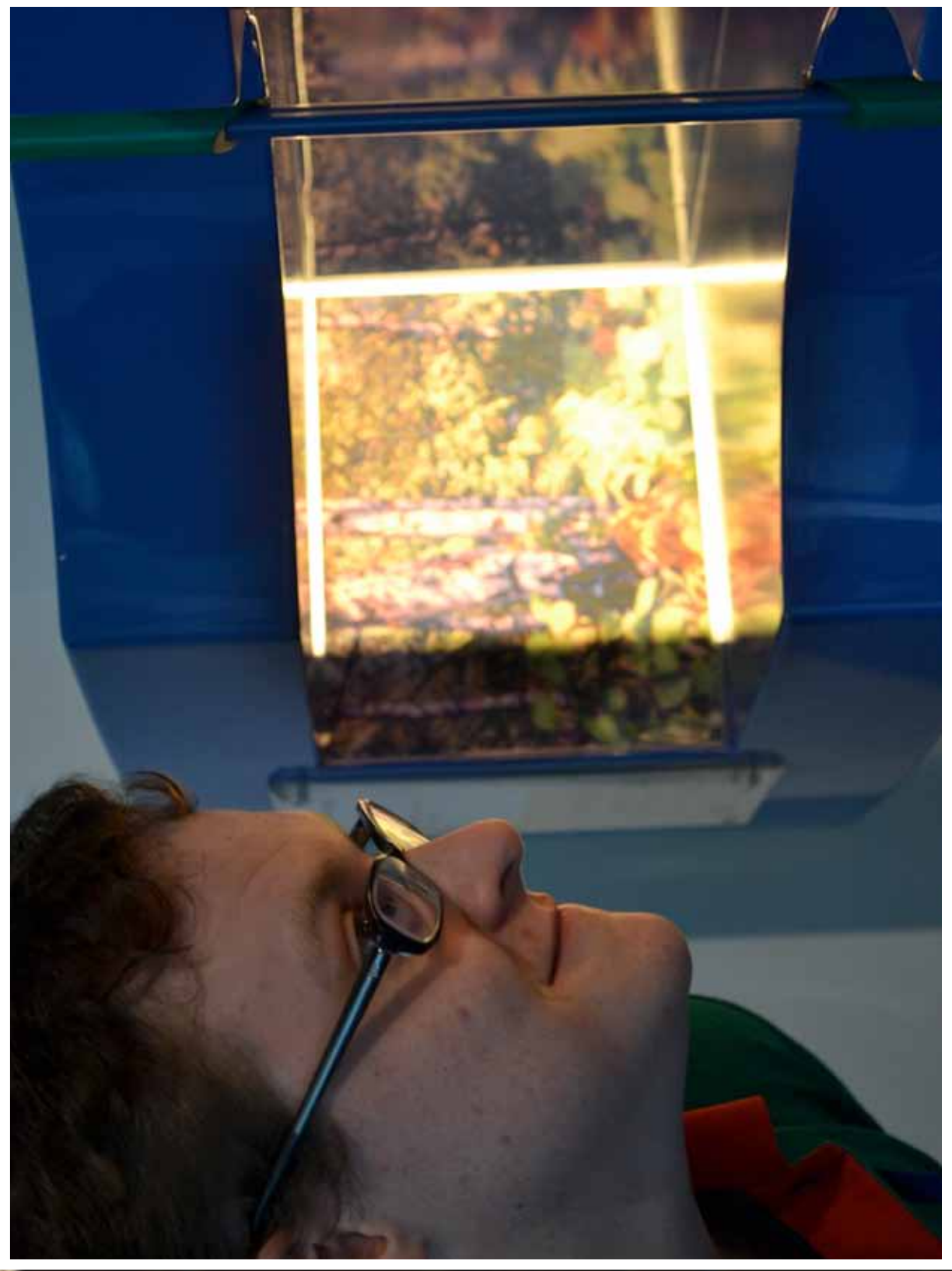






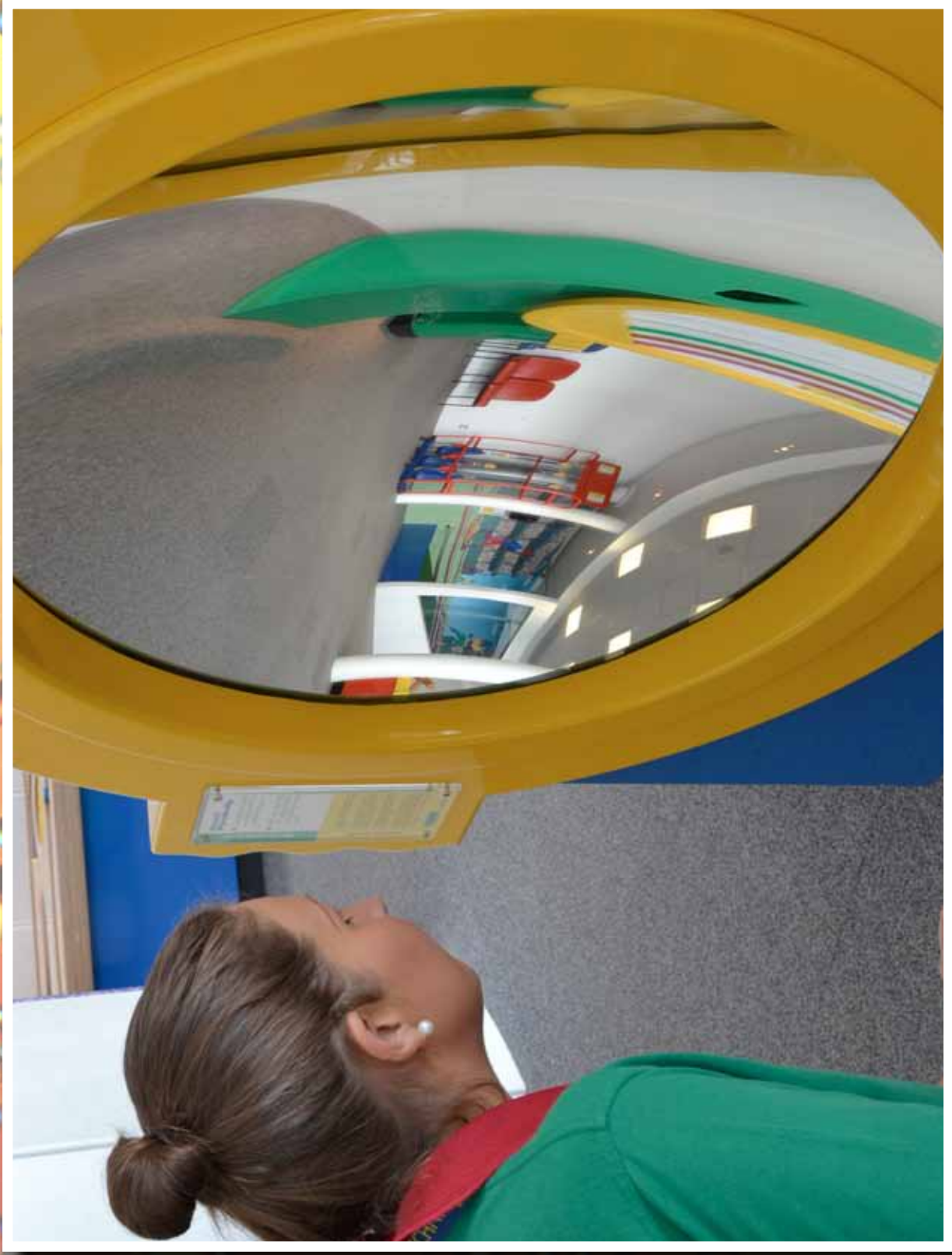












Daf with 'Coloured Shadows':

- Light travelling in straight lines.
- Coloured lights.
- Shadows.
- Darkness - this photograph is taken in Techniquet's Low Light area.

Paul in 'The Wormery':

- Darkness - surrounding Paul.
- Shadows - around Paul's body.

Daf:

- Reflection - this is the exterior of the Low Light area.
- Light - sunlight is shining through the windows.

Liz with 'Plasma Panel':

- Light - created within the exhibit.
- Reflection - other members of Techniquet staff can be seen reflected in the acrylic of the exhibit.

Daf with 'Hot Air Balloon':

- Reflection - Daf is reflected in the mirror in the base and in the green sides of the exhibit.
- Light - these are reflected in the mirror from the ceiling.

Liz with 'WYSIWYG':

- Light - from the base of the exhibit and the screen.
- Shadow - under the information stand in the background.
- Darkness - in the low-light area in the back at the right.

Lynda & James with 'Circulating Circuits':

- Light - sunlight through the windows.
- Coloured light - on the exhibit.
- Shadow - Lynda's face to the left of the photograph is in shadow.

Liane and lighting:

- Light - the ceiling lights are a light source for the exhibition.

Gruff with 'Stereo Image':

- Lights - the exhibit is lit and there are also lights in the exhibition
- Reflection - the exhibition has a mirror in it

Amy and Paul:

- Shadows - the sunlight is shining in through the windows behind Amy and Paul, casting long shadows on the exhibition floor.

Liz with 'Echo Tube':

- A place with no shadows - the tube is so long that light cannot easily escape and so the inside of the tube is very dark. Because there are no light sources in the tube, there are no shadows.

Cally with 'Parabolic Mirror':

- Reflection - the exhibition is reflected in the mirror (upside down!)
- Light - the ceiling lights and the light from them are reflected off the mirror

Key Concepts

Light

Darkness

Shadows

Reflection

Light travels in straight lines

Coloured light

Bonus question:

Can you find any places without shadows?

TASC Wheel

Thinking Actively
in a Social Context



Challenge

Amy and Paul were exploring shadows in Techniquest. Paul said, "I think our shadows are grey because there is less light there and it looks dark". Amy thought about it for a while and asked, "What colour would our shadows be if the light was one colour?"

- Explore Amy's question.
- Investigate the shadows of different coloured lights.



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?





I think we will still
be able to see the
white lab coat if it is
in the dark.

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 (reflection, absorption of light).
- The properties of materials relating to their uses (reflection, absorption of light, light sources).

Skills

Communication

Pupils are given opportunities to:

- Search for, access, and select relevant scientific information, from a range of sources.

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.

Developing

Pupils are given opportunities to:

- Use apparatus and equipment correctly and safely.

- Make comparisons and identify and describe trends or patterns in data.
- Use some prior knowledge to explain links between cause and effect when concluding.
- Consider different interpretations and distinguish between facts, beliefs and opinions, giving reasons and beginning to recognise bias.
- 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 any amendments made to the planned approach/method.
- Suggesting how the approach/method could have been improved.
- Linking the learning to similar situations within and outside school.

Skills Framework:

The following skills are also developed through the show:



Developing Thinking



Personal Social Education



Developing Communication

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