



## Support Resources

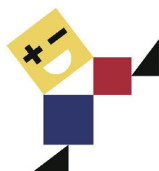


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## Show Summary

Pupils investigate and explore the real life applications of materials in this fun, interactive show. Pupils explore through magic show-like interactive demonstrations, including the use of smart materials, potty putty and, of course, making a white rabbit appear! Pupils are encouraged to offer their own explanations for what they have observed. Through open questioning and exploration, pupils build on their own experiences of materials to develop their knowledge and understanding.

## Copyright

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## Acknowledgements

This workshop has been funded by the Welsh Government through the National Science Academy. Numerical reasoning activity supported by MathCymru. This workshop has been brought to schools by Morrisons.

## 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



# Materials

In this activity, pupils investigate different types of materials. Their investigation will lead them around the school, finding out about the different uses of materials.

## What you do:

- Split the class into no more than six groups.
- Ask the groups to find examples of materials and their uses around the school.
- Give the groups a time limit to collect this information, e.g. 15 minutes.

## When the pupils return:

- Groups should be awarded two points for each material they have found that no other group identified.
- Groups should be awarded one point for each material they found that at least one other group also identified.
- Groups are awarded an additional point for each use of the material listed.
- As an extra challenge, you could penalise groups for each minute they are late back after the time limit you have set.

## Questions to ask the pupils:

- How many different materials did you find?
- How are these materials used around the school?
- What is it about these materials that makes them suitable for this use?
- Did you find any examples where more than one type of material had the same use?
- What else might you have to think about when you choose materials for building a school?



# Milk and Butter

## Years 3 and 4

- The milk from one cow can make 2 kg of cheese. How many cows are needed to make 20 kg of cheese?
- I have 16 cows and would like to put 4 in each field. How many fields do I need?
- I want to put all my cows in one field. Each cow needs a space of 2 squares by 4 squares. How big does the field need to be? Draw it on cm squared paper.



## Years 5 and 6

- I have a farm with some cows and a dairy that makes cheese and butter. For every 100 litres of milk, I can make 96 litres of milk and 4 litres of cream. 96 litres of milk will make 12 kg of cheese. 4 litres of cream will make 1.6 kg of butter.
- How many litres of milk would you need to make 120 kg of cheese and 16 kg of butter?
- I can sell the cheese for £1.20 per 250 g and butter for £0.80 per 250 g. How much money would I make if I sold 100 kg of cheese and 20 kg of butter?





## TASC Wheel

Thinking Actively  
in a Social Context

### Challenge

Rhys and Amy are planning on building a treehouse. They sit down together and start to plan how best to build their new den when Rhys turns to Amy and says, "I think that we should only use materials that don't hurt the planet." Amy thinks about this for a while and then says, "Is that what people call sustainable materials?"

- Explore Amy's question.
- Investigate sustainable materials.
- Discuss as a class whether or not it is important to use sustainable materials. Carry out research to support your decision.
- What else should you think about when choosing building materials?





## 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:

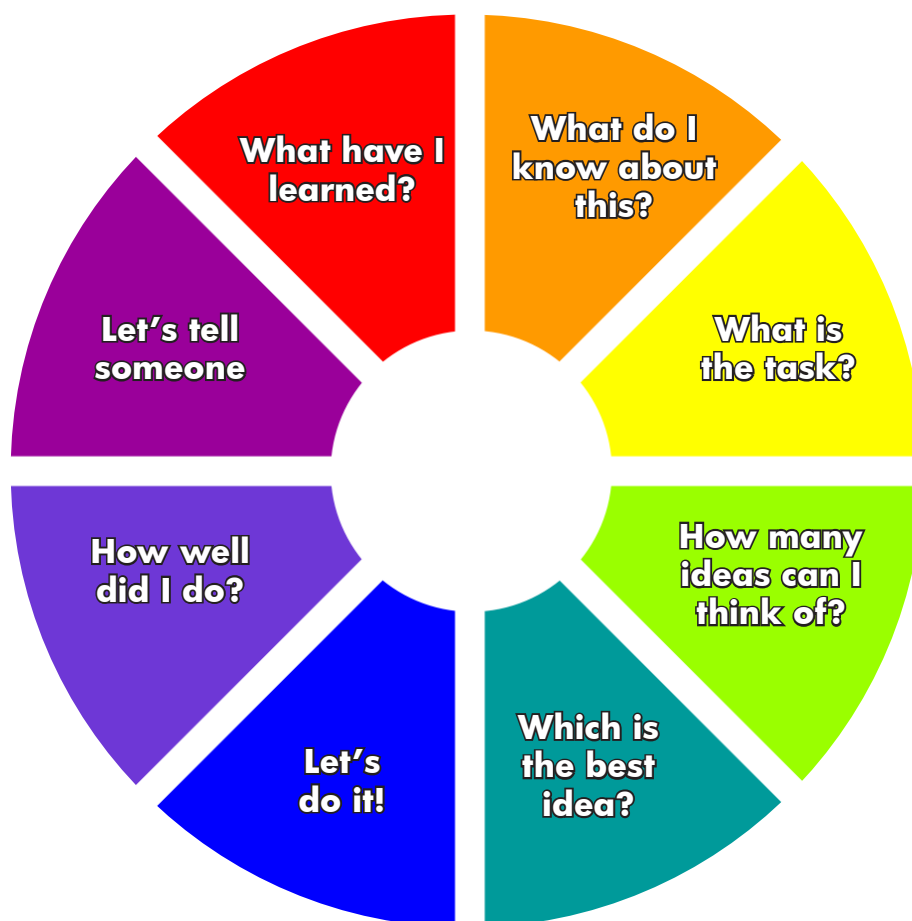
- Who will you tell?
- How will you tell or present?
- What will you say?
- How will you explain?
- How will you interest others?

## 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:

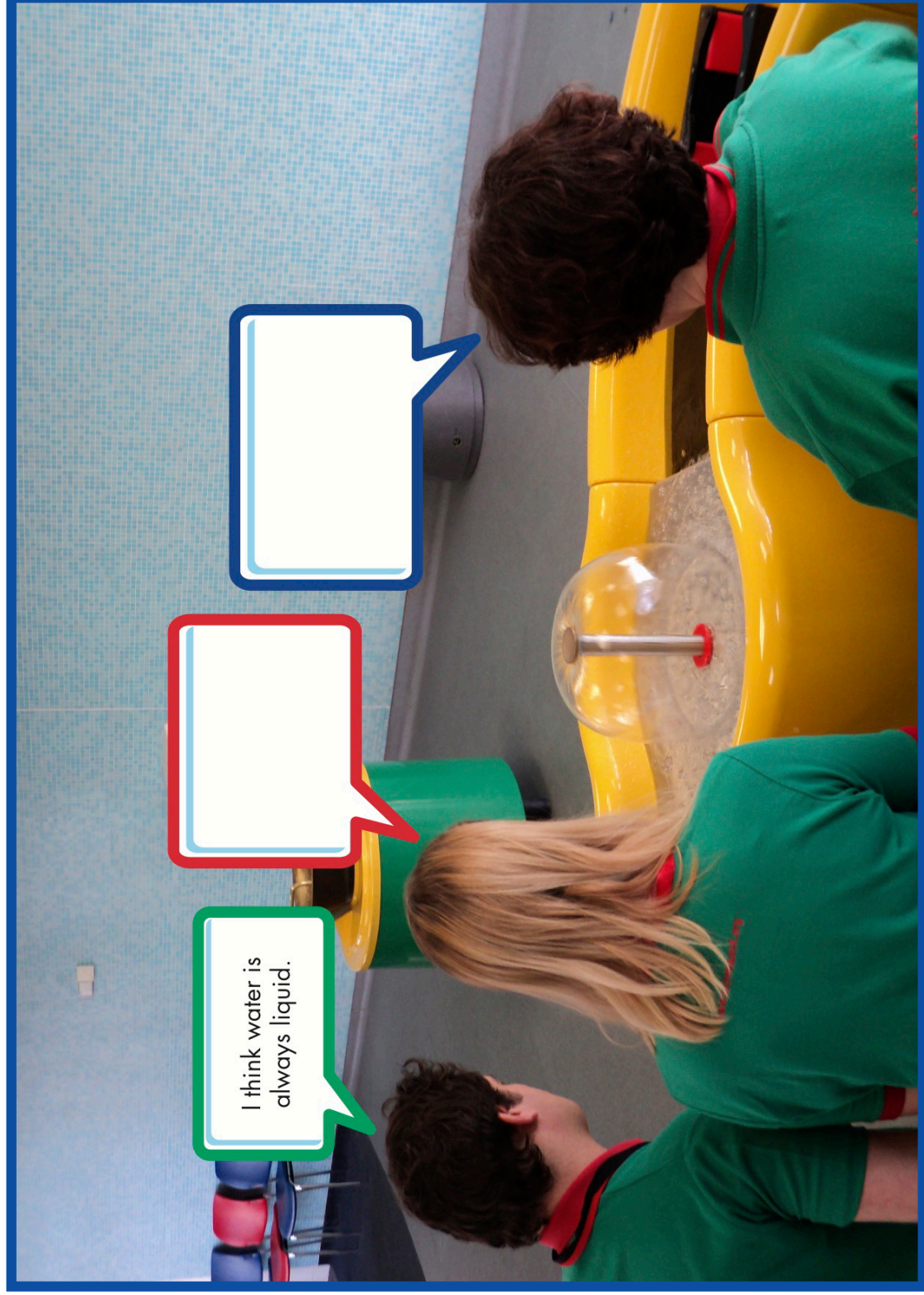
- Do you agree with any of the people in the picture? Who? Why?
- Do you disagree with any of the people in the picture? Who? Why?
- Can you think of any other explanations that are not included here?
- How can we find out which point of view is the most suitable?
- Is it possible that more than one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

#### 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:

- Search for, access and select relevant scientific information, from a range of sources, including ICT.
- Communicate clearly by speech, writing, drawings, diagrams, charts, tables, bar charts, line graphs, videos, and ICT packages, using relevant scientific vocabulary.
- Use standard measures and S.I. units, e.g. kg, s, N, m.

### 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.
- 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 any amendments made to the planned approach/method.
- Suggesting how the approach/method could have been improved.
- Describing how they have learned and identifying the ways that worked the best.
- Linking the learning to similar situations, within and outside school.

# Skills Framework

## 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.

#### Key

- Main focus
- No intended focus
- Incidental focus

## 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.