



Support Resources

Techniquest
Stuart Street
Cardiff Bay
Cardiff
CF10 5BW

Tel: 029 20 475 475
www.techniquest.org



Llywodraeth Cymru
Welsh Government

THE EQUITABLE CHARITABLE TRUST



Summary

On which planet is a day longer than a year? Are all planets the same size? Which planet is nearest to the Sun and which is furthest away? How far have we voyaged in our Solar System? In this mobile planetarium show, follow humanity's exploration of our Solar System. Our journey takes us from landing on the Earth's Moon to travelling with probes launched 35 years ago and about to leave our Solar System. Through the use of open questioning the pupils will discover all about our Solar System and objects that we have explored within it.

Copyright

Teachers may reproduce the following materials without infringing copyright, so long as copies are made for use in their own schools. The permission of Techniquest must be obtained before reproducing these materials for any other purpose.

Acknowledgements

Special thanks to the Welsh Government and the Equitable Charitable Trust for their support. Thanks to the pupils and teachers of Stacey Primary School, Baden Powell Primary School and Lincarf Primary School for their support and ideas. Numerical reasoning activity supported by MathCymru.

Skills Development

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



Developing
Communication



Developing
Number



Developing
Thinking



Personal Social
Education



Making Craters

Some moons and planets in our solar system have craters on their surface. Carry out this activity to investigate the factors that affect the shape, size and depth of these craters.

What you need:

- Floor covering (e.g. newspaper)
- A range of round objects (e.g. marbles, balls) that vary in size and weight
- Plastic tray with raised edges
- Plain flour
- Cocoa powder
- Flour sifter or salt shaker
- Metre rule

What you do:

1. Spread the floor covering and tape where necessary to avoid trip and slip hazards.
2. Place the tray in the center of the floor covering.
3. Place a 5cm layer of flour in the tray. It should be smooth but not compacted.
4. Sprinkle a thin layer of cocoa powder over the surface enough to cover the flour.
5. Drop the 'meteorites' onto the cocoa powder. For each meteorite, note its size and weight and the pattern left in the cocoa powder.

Ask pupils to think about:

- What were you comparing in your test?
- Did you drop a selection of meteorites from the same height or did you drop one meteorite from different heights?
- Which variables did you keep the same? Which variables did you change?
- How did you make sure it was a fair test?
- What results did you get? What does this tell you about how craters are formed?
- How could you set up an investigation to explore how the angle a meteorite hits a planet affects the crater made?



Trip to the Moon

Years 3 and 4

- Put the following in order from smallest to largest: Jupiter, earth, moon, sun.
The earth is smaller than Jupiter but larger than the moon.
Jupiter is smaller than the sun.
- Neil Armstrong was the first person to step onto the moon. He took off from earth on Wednesday 16th July 1969, and landed back on earth 8 days later. What day of the week and date did he land back on earth?
- Approximately how long did it take for the astronauts to reach the moon?
- I want to spend three days on the moon. I take off on Tuesday 2nd May. What day do you estimate I will return to earth?



Years 5 and 6

- Ffion is an astronaut. One morning she stood on her scales and it read 60 kg. Ffion thought to herself, "If I stood on my scales in other places in the solar system, what would the scales read?"
On Mercury, it would be three times less than on the earth.
On the moon, it would be one-sixth it is on earth
On earth It would be three times more than on Mars.
On Jupiter it would be two and a half times more than on the earth.
Pluto would be 15 times less than on earth.
- Calculate Ffion's weight in these different places.



Teachers' note:
How much you weigh depends on your mass, the mass of the object, and the distance you are from their centre of that object.



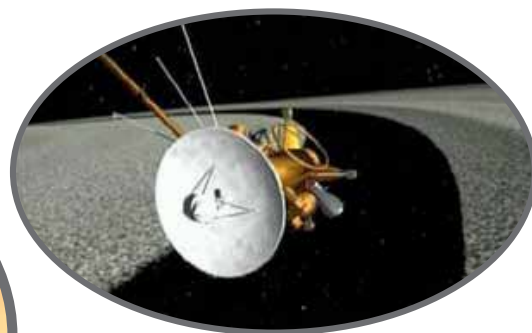
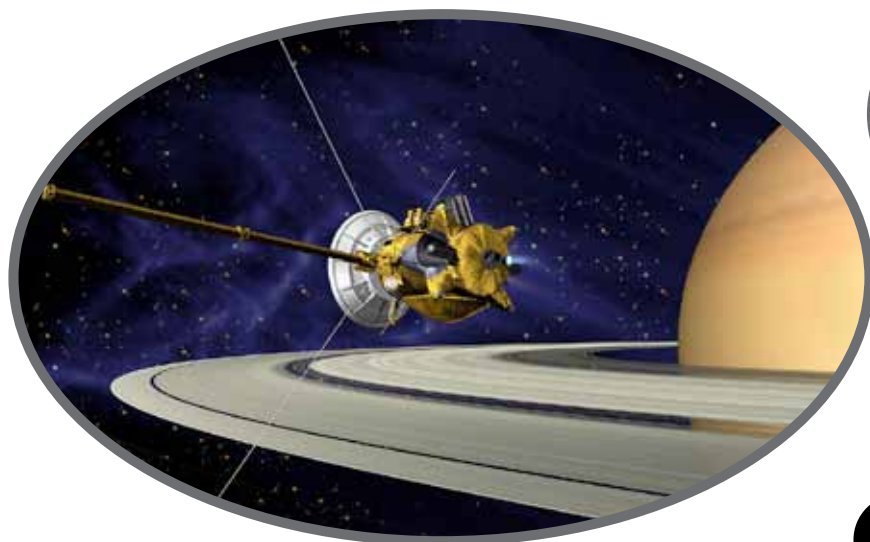
TASC Wheel

Thinking Actively
in a Social Context

Challenge

Paul and Betsan were watching a television programme and they heard about different space missions – the Cassini mission going to Saturn’s moons, Europa to Jupiter’s moons and Rosetta going to a comet. Betsan asked, “If they were looking for life what would they need to find out?”

- Explore Betsan’s question. Investigate the conditions needed for life.
- Research one of the moons of a different planet.
- Design a probe to go to your chosen moon and decide what equipment it would need to explore the moon.
- 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 Techniquet'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:

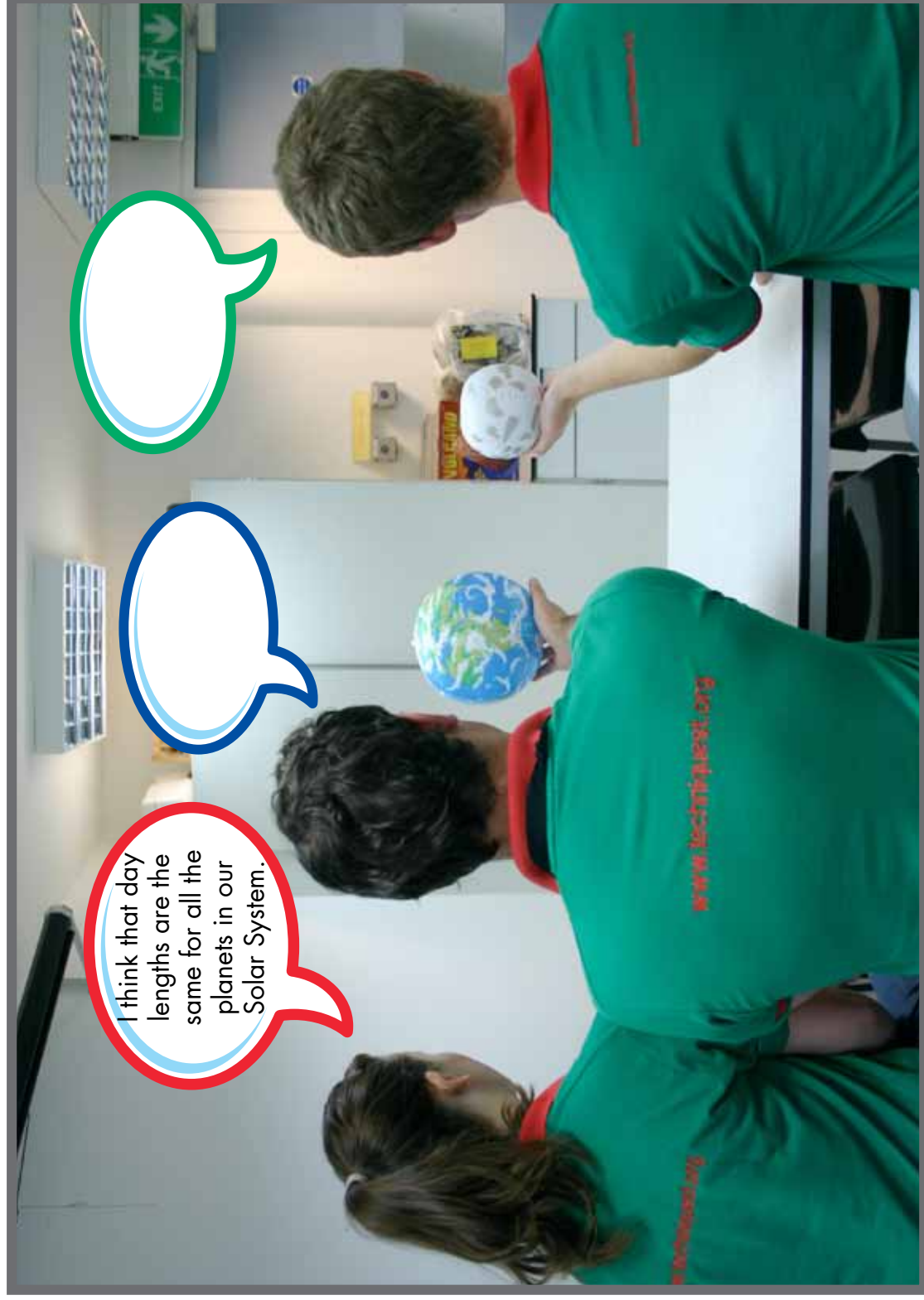
- Do you agree with any of the people in the picture? Who? Why?
- Do you disagree with any of the people in the picture? Who? Why?
- Can you think of any other explanations that are not included here?
- How can we find out which point of view is the most suitable?
- Is it possible that more than one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

- The daily and annual movements of the Earth and their effect on day and year length.
 - The relative positions and key features of the Sun and planets in the solar system.
-

Skills

Communication

Pupils:

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

Enquiry

Planning

- The choice of success criteria.
- Predictions using some previous knowledge and understanding.
- Where and how to find relevant information and ideas.

Developing

Pupils:

- 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:

- 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

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