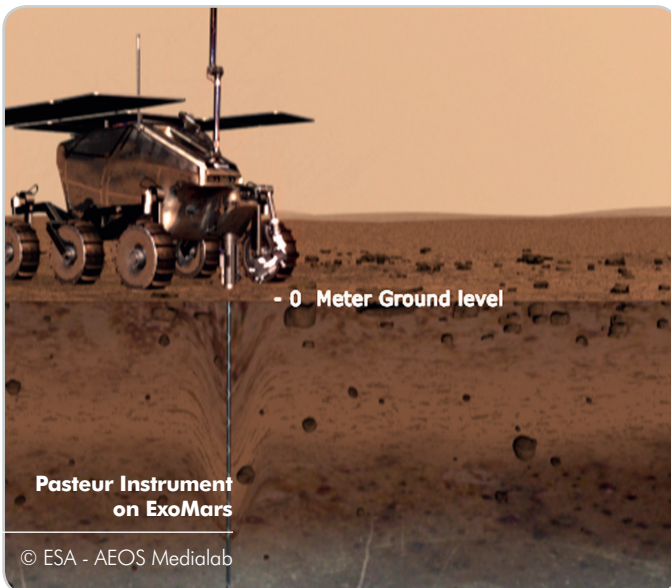


Context

The ExoMars rover is an autonomous robot that will travel across the Martian surface searching for life. It will drill up to two metres below the surface of Mars collecting small samples, transferring them to a laboratory in the heart of the vehicle; here they will be crushed to a fine powder and tested for molecules that might provide evidence of life.

In this activity, the children work cooperatively to solve a problem. Their challenge is to find ways to transfer materials from one container to another.



Lesson starter

Show a hand drill or a picture of a drill. Who knows what this is? What is its job? The end of the drill turns round and round and makes holes. Show the children nuts and bolts, showing how the nuts and bolts turn rather like the drill bit. Set the children a challenge to screw and unscrew nuts and bolts before the timer runs out!

Show the new robot, the ExoMars rover, that is being sent to planet Mars. It has a special drill:

exploration.esa.int/science-e/www/object/index.cfm?fobjectid=53910

It can drill down under the soil, take rock samples and move them inside the rover to be tested:

exploration.esa.int/mars/45796-the-exomars-drill-video

Resources

- Hand drill or toy drill
- Large nuts and bolts
- Timer
- Colander
- Story: 'Rosie Revere, Engineer' by Andrea Bearly
- Bowls
- Buckets
- Plastic pipe
- Guttering
- Sponges
- Spoons
- Cups
- Sand
- Cardboard tubes

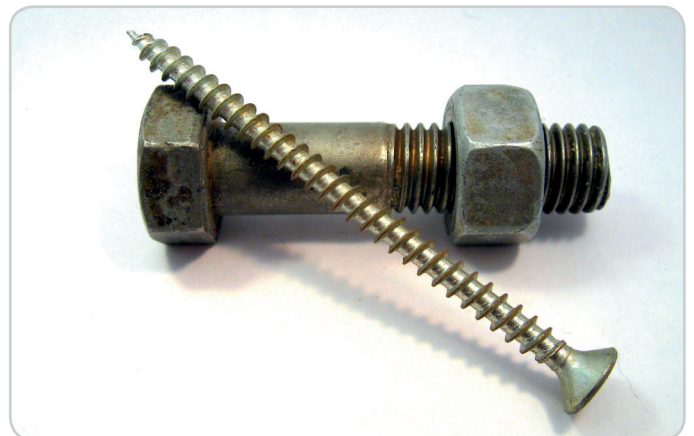
National curriculum links

Understanding the world:

- Exploring and finding out; explaining why things happen
- Select and use tools in practical tasks

Personal social and emotional development:

- Talk about their ideas
- Work cooperatively and organise activities



Main activity

Explain that today the children have a challenge. Just like ExoMars moving the samples it has drilled, they are going to move different materials from one container to another! They must choose the best equipment to help move the materials and work together.

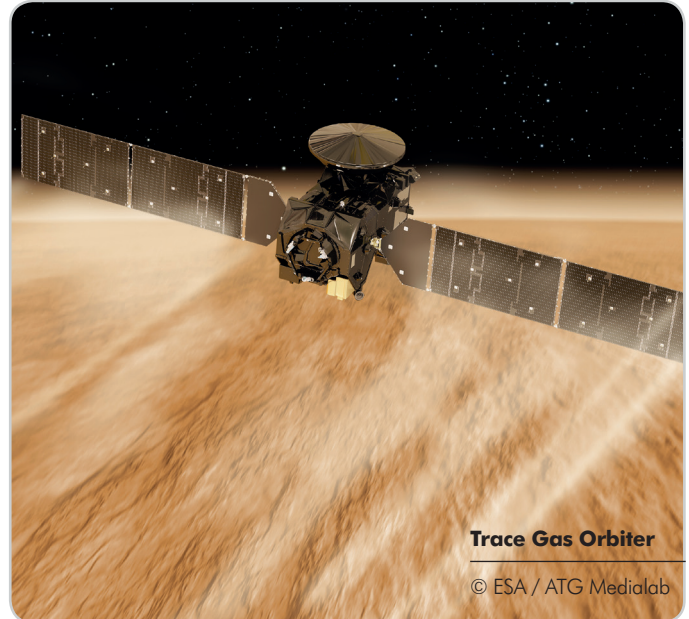
Demonstrate transferring water from one bowl to another using a colander! Is this a good method? Ask the children to suggest a better way. Let's investigate!

Provide each group with two bowls set out a distance apart, one filled with water, and provide a variety of equipment such as tubes, spoons, cups, a length of guttering and sponges. The children investigate different methods of transferring the water from one bowl to the other. Remind them that they must try not to spill the water on the way. Finally, they decide which method was most efficient.

- Which group managed to transfer most liquid?
- How can we find out?

They could easily compare the volumes of water in each group's second bowl if similar transparent bowls were used; adding colour to the water would make the levels easier to see.

Why not set up further challenges using different materials such as dry sand or marbles?



Trace Gas Orbiter

© ESA / ATG Medialab

Plenary

Did they enjoy working together? Which was the best way to move the water, sand or marbles?

Explain that engineers think of ways to solve problems like this. Engineers who built the ExoMars rover designed how the rover moves samples from the ground into the rover after drilling.

Read the story of 'Rosie Revere, Engineer' by Andrea Beaty.

Further activities

The children imagine they are engineers. What machine would they build? How would it work?

Design and build another tool for the ExoMars rover to use.