

These notes accompany the section titled 'Marvellous Machines', to support teachers in carrying out the three activities. They provide background information, tips for advanced preparation, opportunities for cross curricular links and a suggested reading list and useful website links for enrichment.

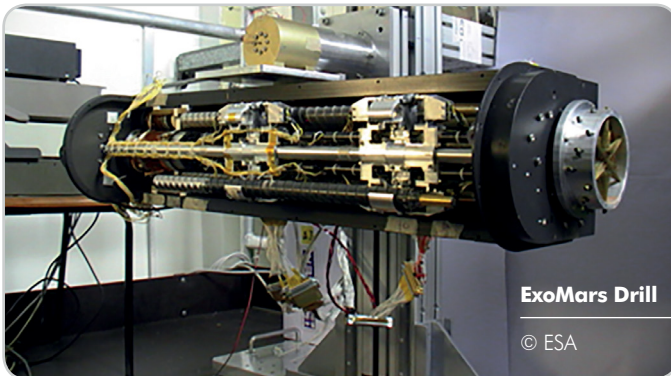
Background information

The activities in this section are based upon the ExoMars rover's mission to search for evidence of life under the Martian surface.

The ExoMars drill is designed to obtain soil samples down to a maximum depth of two metres, in a variety of soil types.

Its main function is to penetrate the soil, acquire a core sample 1cm in diameter and 3cm in length, extract it and deliver it to the inlet port of the rover where the sample will be crushed and analysed.

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



EYFS Activity

Advanced preparation

The main activity challenges the children to use a variety of implements and containers to transfer water from one bowl to another a distance away. Teachers may prefer to set up this activity outdoors. It may be undertaken as a circus of activities, each one providing different resources for the water transfer; alternatively, one complete set of resources and bowls can be provided in one place and groups can take turns trying the activity throughout the day.

Cross curricular links

Communicating:

- Opportunities for speaking and listening in different situations

Mathematics:

- Counting eg how many spoons or cups of water or measuring when comparing volumes of water
- Recording in the form of pictograms

Personal social and emotional development:

- Coordination when handling equipment and developing social skills, such as learning to take turns

Expressive arts:

- Role play as space engineers

KS1 Activity

Advanced preparation

The activities may be undertaken outdoors or in the classroom. If outdoors, provide a PE mat for each group, or mark out areas large enough for each rover to accommodate a group of children seated within. Then, set out the bowls of samples around each rover. Alternatively, in class, the children are seated at their tables and each table represents a rover; place the samples on the floor around the tables, within reach of the children using the robot arms.

Prepare samples of the materials in bowls, for each group. Label each sample 1 to 8.

Clipboards would be useful when recording.

Cross curricular links

English:

- Communicating instructions to others
- Describing sample materials
- Producing labelled drawings of samples
- Writing a report about their findings for the Space Agency
- Writing stories or poems with imagination, individually or as a class, about an adventure on Mars

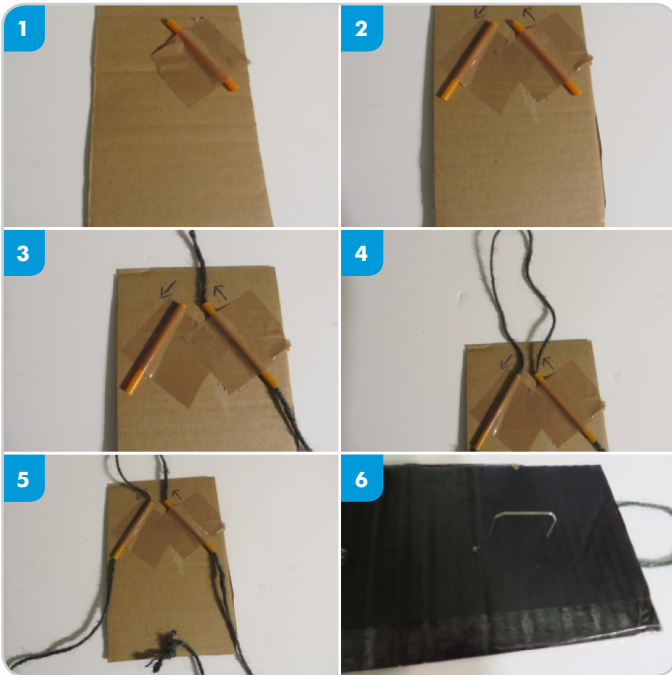
Design and technology:

- Exploring the tools for collecting samples, they could go on to generate ideas for other functional tools or mechanisms to be used on Mars

KS2 Activity

Pulleys

Simple machines make life easier by reducing the effort involved in everyday tasks such as moving loads. Pulleys are simple machines that change the direction of a force. Examples include blinds, garage doors and flag poles. Usually, they involve a rope and a wheel with a groove but the pulley in this activity uses cardboard, string and a chair leg! Our cardboard pulley demonstrates the force of friction. When the string is pulled, the cardboard turns and friction between the straw and the string makes the pulley stop. Pulling each string in turn produces a forward movement. Pulling the string at the back of the card will return the device to its starting position.



Advanced preparation

How to make the pulley machine

Step 1: Tape a short length of a straw diagonally to a piece of card.

Step 2: Stick a second length of straw diagonally to make a 'V' shape.

Step 3: Thread the string through the first straw starting from the bottom.

Step 4: Pass the string behind a chair or table leg and then through the second straw from top to bottom.

Step 5: Tie another string at the back end of the card.

Step 6: Make a hook from a paper clip. Pierce the centre of the cardboard from underneath with one end of the paper clip and bend and secure it to the card with tape, leaving the hook under the card.

Soil samples

Prepare three Martian soil samples per group. Milk bottle tops or small disposable cups are ideal containers. Attach a handle made from a paper clip to each of the containers. Add two teaspoons of sand, preferably builders' dried red sand, to each container to make it more Martian! Add half a finely crushed effervescent tablet to one of the three samples and mix well.

The children will test each sample for possible signs of life by looking for any bubbles produced after adding warm water to each sample, sufficient to cover the sand. When water is added to an effervescent tablet a chemical reaction takes place and bubbles of carbon dioxide gas are produced, but the reaction soon stops. If microscopic life were present, gas would continue to be produced so long as the organism was living; it would be a sustained reaction.

Cross curricular links

English:

- Write an information text describing the working of the pulley or a piece of creative writing about discovering life in a sample of Mars soil

Mathematics:

- Measure the time taken for the pulley to travel from the starting point to a particular distance; repeat for increasing distances
- Plot a graph of distance travelled versus time

Science:

- Go on a hunt to find examples of simple machines around school and produce an information poster

Computing:

- Produce a video showing the pulley at work or a presentation explaining each stage of the making of the pulley; research the internet to discover more about landers and rovers on Mars

STEM clubs

The activities and extension activities would be suitable for after school science or STEM clubs.

Books

'The Fort on Fourth Street: A Story about the Six Simple Machines' by Lois Spangler

'The Lighthouse Keeper's Lunch' by Ronda Armitage
(www.teachertube.com/video/the-lighthouse-keepers-lunch-388166)

'The Story Machine' by Tom McLaughlin

'Most Magnificent' Thing by Ashley Spires

'Curiosity: The Story of a Mars Rover' by Markus Motom

Useful links

www.esa.int/kids/en/learn/Life_in_Space/Exploration/ExoMars

exploration.esa.int/mars/45084-exomars-rover/

www.nasa.gov/mission_pages/msl/index.html

www.nasa.gov/mission_pages/msl/videos/index.html

tinybop.com/apps/simple-machines Simple Machines by TinyBop (Physics learning game App)

