

ACTIVITY 3.4 DESIGN YOUR MARS ROVER

From the Chapter Three of the
Mission Mars Diary
[marsdiary.org/activities/design-
your-mars-rover](http://marsdiary.org/activities/design-your-mars-rover)

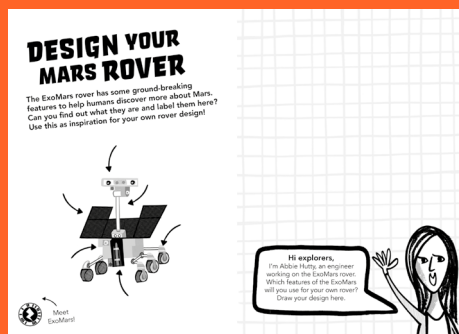
LEARNING LEVEL

KS2, P5-7, Y4-6

CURRICULUM LINKS & DIFFERENTIATION IDEAS

View detailed curriculum links
for England, Scotland, Northern
Ireland and Wales in the Teacher
Toolkit, plus differentiation ideas
for your region and year level.

[marsdiary.org/resources/#teacher-
toolkit](http://marsdiary.org/resources/#teacher-toolkit)



Resources Required

- Smartphone or device for Zap code (optional – see Useful Links)

Background to this Activity

In this creative and technical design challenge, students will have to think about what functions they require a rover to deploy while working together on the surface of Mars. Students will have to consider the differences between human and robotic exploration – and think about the strengths and weaknesses of both kinds.

The ExoMars rover, which is being developed by the European Space Agency, will travel to Mars in 2020 to look for signs of life. It will collect samples with its drill and will analyse them, sending data and information back to Earth. Unlike the rovers currently on Mars, the ExoMars rover is capable of both moving across the Martian surface and studying Mars in depth. It will be able to establish the physical and chemical properties of Martian samples, including those below the surface of the terrain.

The drill on ExoMars can reach a depth of two metres. Once a sample is collected, it will investigate the minerals and chemicals in the sample, using its analytical laboratory.

The rover uses solar panels to generate power, and is designed to withstand the cold conditions on Mars. It has six wheels which can pivot independently, to help it move across the rocky terrain. It also has a camera system, so that scientists on Earth can help it locate the best sites for drilling.

Running the Activity

Watch the ESA clip (see Useful Links). Working in small groups, make some notes on the design of the ExoMars rover and how it functions on the surface of Mars. Feed these group ideas back to the whole class.

Explain to the children that they are going to label the different parts of the ExoMars rover and consider why the rover needs them. Review each part using the information below (see Solutions to Activities). Explain to the children that they are going to think about designing their own rover. First of all they need to consider what role it will take:

- To collect rocks from the surface
- To drill into surface to take deeper samples
- To monitor weather conditions (in planets with atmospheres)
- To measure temperatures and atmosphere composition below/above surface
- For observation
- To search for extraterrestrial life

Once the children have decided on their rover's purpose they can consider the necessary design features (e.g. power, movement, information collection).

Solution to the Activity

Parts of the ExoMars rover:

- Solar array panels to produce all the energy I need to recharge my batteries. There are no plug sockets on Mars!
- Body – My body is a completely sealed box so that all my instruments and computers are kept warm and protected from the Martian environment like cold temperatures and sand.
- Pivots – Each pair of my wheels is attached to a pivot so that all my wheels stay touching the ground even while I drive over rocks and through gullies.
- Cameras – Two cameras let me see where I'm going.

ACTIVITY 3.4 DESIGN YOUR MARS ROVER

From the Chapter Three of the
Mission Mars Diary
[marsdiary.org/activities/design-
your-mars-rover](https://marsdiary.org/activities/design-your-mars-rover)

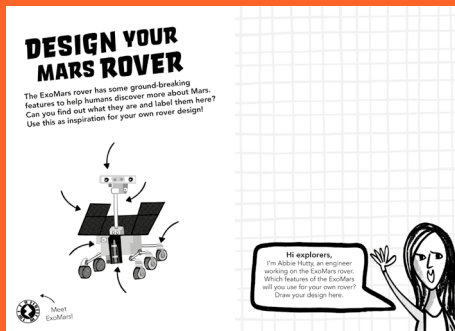
LEARNING LEVEL

KS2, P5-7, Y4-6

CURRICULUM LINKS & DIFFERENTIATION IDEAS

View detailed curriculum links
for England, Scotland, Northern
Ireland and Wales in the Teacher
Toolkit, plus differentiation ideas
for your region and year level.

[marsdiary.org/resources/#teacher-
toolkit](https://marsdiary.org/resources/#teacher-toolkit)



- Long neck
- Wheels
- Drill

Questions for the Class

- What parts can you see on the ExoMars rover?
- How do the different parts make the rover effective?
- What role does your new rover have?
- What parts do you think any rover would need?
- Can you explain why certain features have been chosen? Why is your rover suited to Mars?

Additional Challenges / Extension Activities

Make a 3-D model of the rover design. You could incorporate electronic including lights and motors.

Explore how rover designs have developed over time as more missions have been sent to Mars.

Investigate how the rover might need adapting to visit other planets.

Ideas for Differentiation

Lower:

- Write instructions on how the rover works
- Annotate design sketches

Upper:

- Write an explanation about how the rover works
- Develop design sketches using exploded diagrams and cross section drawings
- Sketch a range of alternative ideas before selecting the best option

Useful Links

Zappar Content: Download or view the Zappar content for this activity on its webpage (URL to the left) or access it via the Zap.

Interactive diagram of NASA's Mars rover 'Curiosity':
<https://mars.jpl.nasa.gov/msl/mission/rover/>

ESA clip showing animation of ExoMars collecting rock samples, and also the Martian terrain: [https://youtu.be/SvKUe-
q0ZC4?list=PLbyvawxScNbvS4TUXFpaxXwUgzZUd7Pzx](https://youtu.be/SvKUe_q0ZC4?list=PLbyvawxScNbvS4TUXFpaxXwUgzZUd7Pzx)

ZAP! Students can independently access multimedia resources using the Zappar mobile/tablet app. See Zappar instructions at the link below and note that the mobile/tablet will need to be on a WIFI connection:
marsdiary.org/resources/#teacher-toolkit

If you don't have access to the internet in the classroom, all Zap code content is available to download on the activity's web page (see link to the left) as a PowerPoint presentation or as bundles of images.



Find more great space-themed STEM resources at
<https://www.stem.org.uk/esero>