Your Mission
MARS DIARY

ACTIVITY 2.1
GOING THE DISTANCE

From the Chapter Two of the Mission Mars Diary
marsdiary.org/activities/going-the-distance

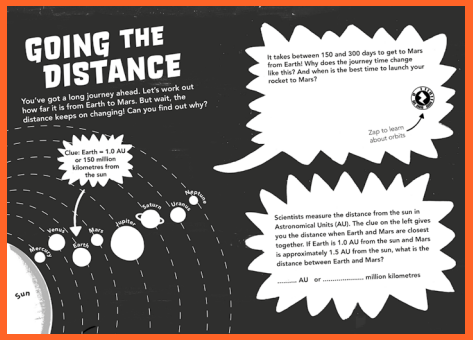
LEARNING LEVEL

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



Resources Required

- Smartphone or device for Zap code (optional – see Useful Links)
- Various sized spheres to represent the sun, Earth and Mars

Background to this Activity

This exercise helps students to comprehend the scale of the solar system and the huge distances involved in travel in space. It gives the students a chance to take an overview of the solar system as a whole while also learning about how orbits affect the distances between individual planets. It also introduces students to Astronomical Units (AU).

The distance between the Earth and the sun is about one hundred and fifty million kilometres. This is a big number, and so astronomers use astronomical units to describe this distance. One astronomical unit, or 'AU', is the distance between the Earth and the sun. It is used to compare the distances of other bodies in the solar system, such as the sun, the planets, comets, and asteroids.

This activity also asks students to consider planetary orbits and how these affect distances between the planets. When the planets are closest, it will take six months for astronauts to travel from Earth to Mars. A return trip however will take 500 days. The ExoMars mission launch date will be planned very carefully, taking the orbital paths of Earth and Mars into consideration, so that the ExoMars rover can arrive safely at the landing site on Mars.

Running the Activity

Ask the children to recap what they know about the solar system. Revise the order of planets including Pluto as a dwarf planet. Explore why it was reclassified using other dwarf planets and moons in the Kuiper Belt.

Within the solar system what is moving and what is stationary? Emphasise that the sun doesn't move and the planets orbit around it. Discuss measuring distances from the sun in AUs. Can the children suggest any reasons why scientists use the sun as a starting point for AUs? Watch the clip showing the orbits of planets around the sun (see Useful Links).

What do the children notice? Encourage the children to identify the different lengths of orbits taking place. Explain to students that they are going to look at the distance between Earth and Mars. Ask them to explain why the distance between Earth and Mars might change.

Put students into groups and provide them with spheres to represent the sun, Earth and Mars. Ask them to model the orbits of Earth and Mars based on what they saw in the clip. Challenge the more capable children with a further sphere to represent Earth's moon or alternatively provide more spheres to model the entire solar system.

Solution to the Activity

Distance between Earth and Mars: 0.5 AU or 75 million kilometres

Questions for the Class

- What does orbit mean?
- How do we define a year?
- How long would it take to travel 75 million km to Mars?
- How long is a Martian year? (How long does it take to orbit the Sun?)
- Why do planets have different year lengths?
- Why does the ExoMars rover launch need to take account of the orbital paths of Earth and Mars?

Additional Challenges / Extension Activities

Investigate the AU between the sun and other parts of the solar system such as the dwarf planets.

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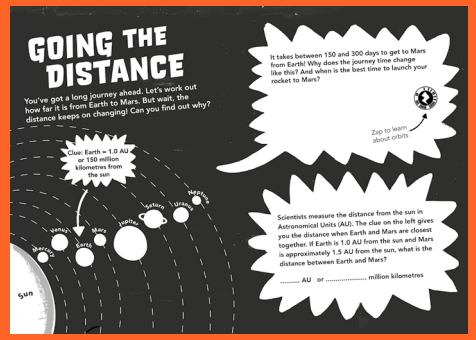

Draw or make a scale model of the solar system using a scaled distance.

Research the similarities between Earth and Mars e.g. number of moons, names of moons, furthest distances apart from each other in AUs and millions of km.

Ideas for Differentiation

Lower:

- Work with a partner to solve the problem
- Provide a word bank to help write an explanation of why the distance between planets keeps changing (e.g. gravity, orbit, speed, planet, sun)

Upper:

- Investigate the AUs between the rest of the planets and Mars. Find the distance from the sun for each planet, then adjust using the AUs from the sun to Mars.
- Write an explanation/answer to the question 'Why does the distance between planets keep on changing?'

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.

Information about our solar system: https://www.esa.int/esaKIDSen/SEM9BNRD2NI_OurUniverse_0.html

An overview of the planets in our solar system: https://solarsystem.nasa.gov/planets/

Animated clip showing NASA's MAVEN launch in 2014 and explaining how to overcome the orbital differenced between Earth and Mars, to get a spacecraft into orbit around Mars: https://youtu.be/1Hm8b-L62y4

National Geographic clip about our Solar System: https://www.youtube.com/watch?v=libKVRa01L8

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.

zappar
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ZAP THE CODE
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GET IT ON Google play

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