

Asking and Exploring Big Questions about Humans Living on Mars

*... through the lenses of Science,
English Literature, Engineering, the Arts
and other disciplines*

What's special about our approach



- Children have preferred subjects and interests by age 9 (possibly before!)
- Seeing disciplines 'in the round' boosts children's sense of belonging.
- We can create stories that help children see themselves playing a role in shaping the future

What is Epistemic Insight?

- Helps people to ask and explore big questions about life
- Gaining an understanding of disciplines and what makes each discipline unique
- Seeing how disciplines can work together



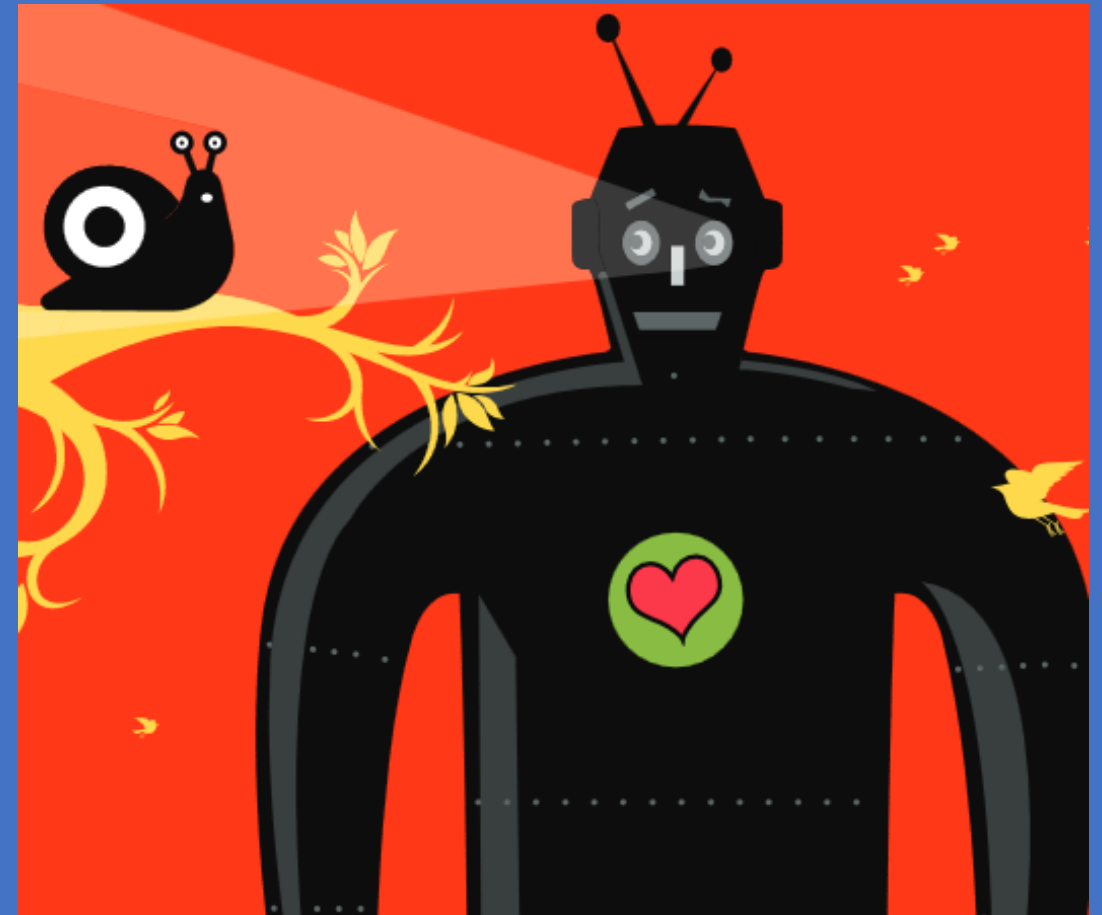
Why - What research tells us

- Children have different preferred subjects. Many children feel alienated by a mistaken perception that becoming a scientist excludes other ways to think.
- Investigating how professions 'work together' on questions they care about helps children to feel included.
- *The epistemic insight discipline wheel stimulates curiosity and understanding about how disciplines work together*



What's the new twist on the problem we are addressing?

- In the age of Search Engines and now AI chatbots, young people have a tool that gives them 'answers with no working'.
- But education isn't about 'answers' – it is about **how** we find out – and what questions to ask!
- Today we look at tools and activities that help children to understand – *"What is knowledge and how do we know what's true?"*



CPD for teachers

Epistemic Insight: Will We Live on Mars?

Developed by Dr Megan Venn-Wycherley and Professor Berry Billingsley, Swansea University

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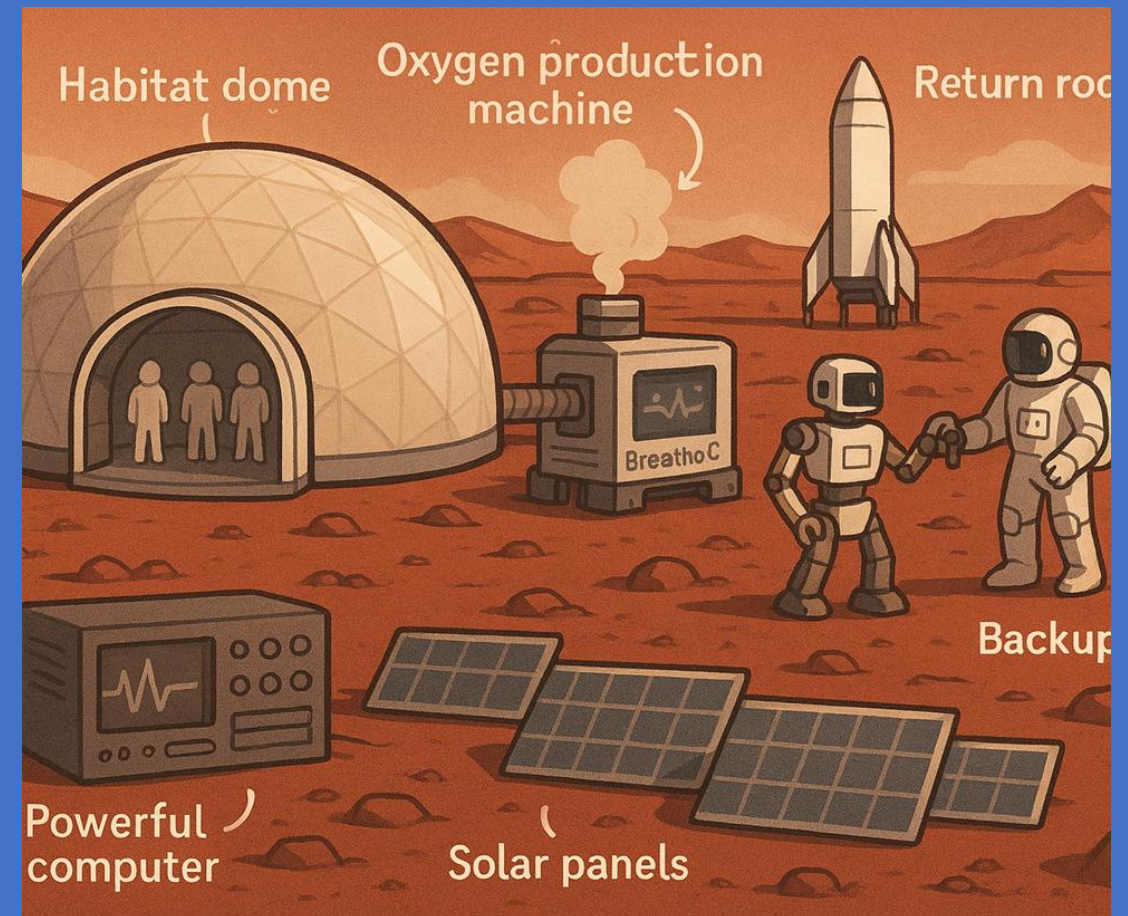


Will We Live on Mars?

This isn't just a science fiction dream anymore!

Right now, scientists around the world are working to answer this very real question. Space agencies are planning missions and studying how humans could survive.

It captures children's natural curiosity about space and it's happening in their lifetime - they could be part of the answer!



Aims and objectives for children



- Helping children to understand that 'observation' is at the heart of science. When we think like a scientist – we are making and talking about observations – to understand the natural world.
- Helping children to grow as 'scholars' thinking about how different disciplines answer questions.

What is a discipline?

How do we know when we're doing Science? History? Maths? Art?

Think – Pair – Share!

- 1 minute: Start to answer this question independently
- 2 minutes: Share your thoughts with the person next to your
- 2 minutes: Share with the group

Science

- **In Science, we:**
 - Observe the world around us and form ideas about how it works
 - Decide how to test our ideas by making predictions about what else we can observe.
 - Make observations and draw conclusions.
 - Share our ideas and conclusions so that others can test them too.



History

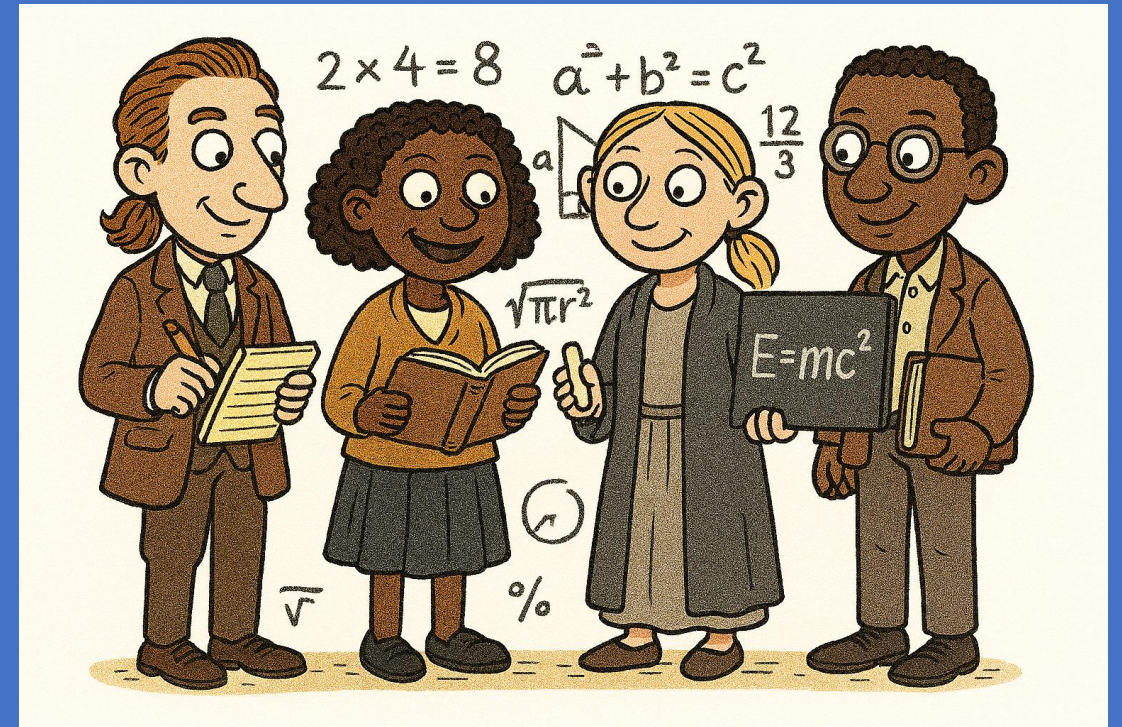
- **In History we:**

- Look at artefacts and texts from the past e.g. letters and testimonials
- Construct explanations and stories about what happened in the past
- Compare sources to test our explanations
- Share our ideas with other historians to see if they agree



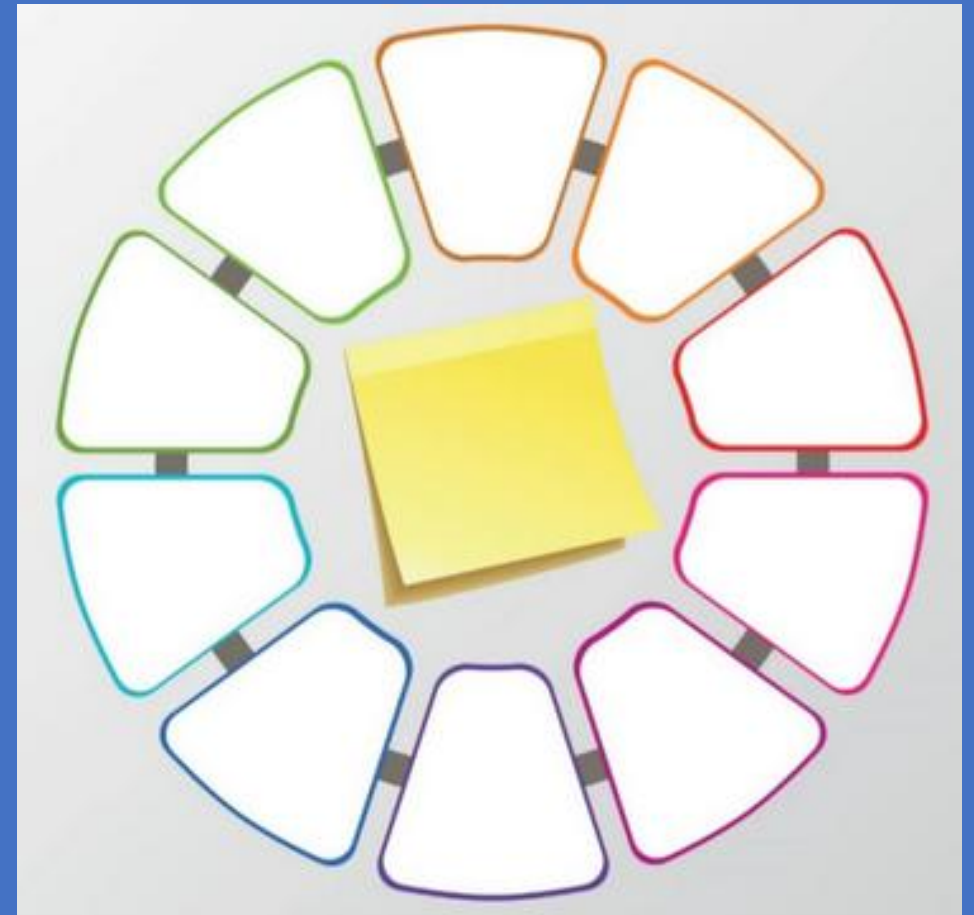
Maths

- **In Maths, we:**
 - Calculate numbers
 - Predict outcomes
 - Solve problems
 - Find patterns



The Discipline Wheel

- Visual tool for exploring big questions
- Shows how disciplines contribute
- Helps identify gaps in understanding



Why use it?

Helps children see that the subjects we teach aren't random, and provide a different way to look at the world around us

Develop critical thinking

Help them see the value of learning different disciplines, and explore their own interests

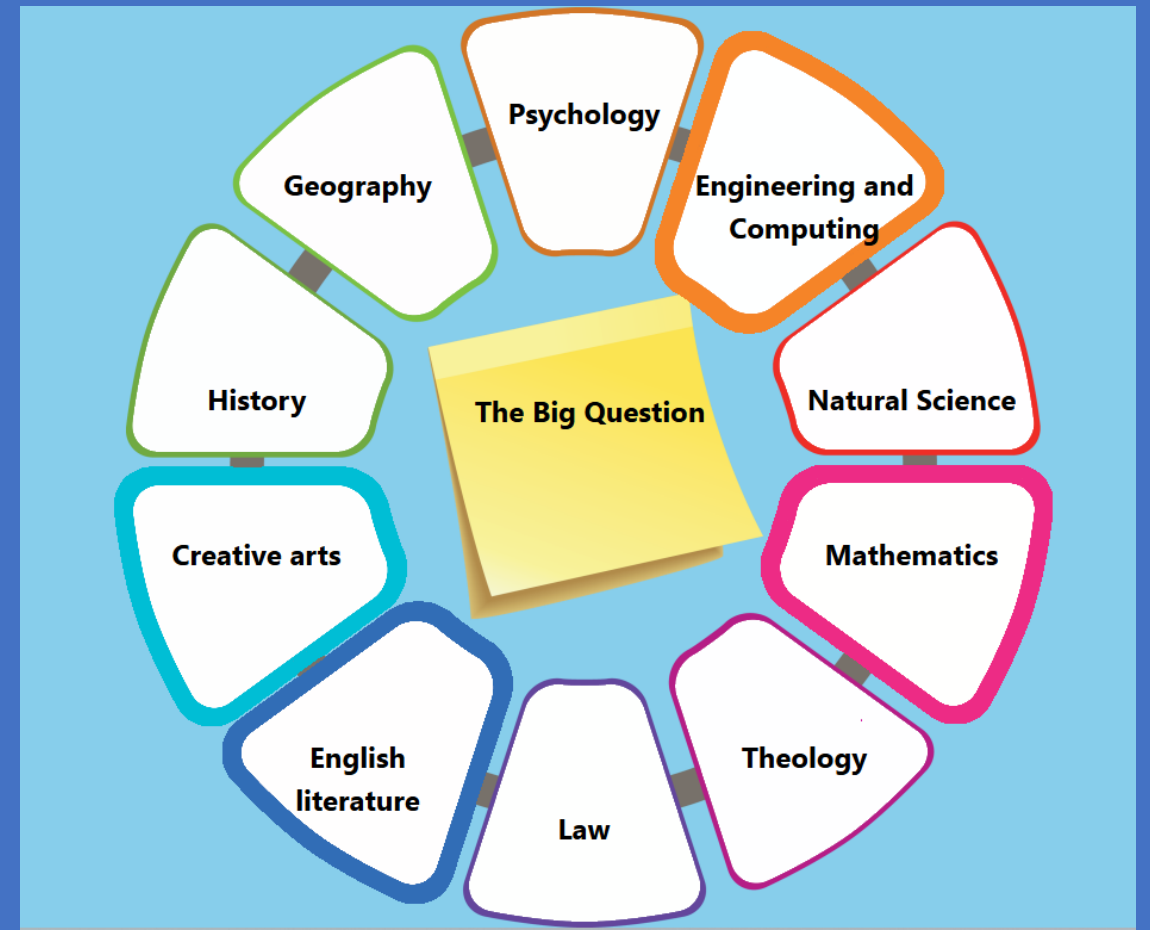
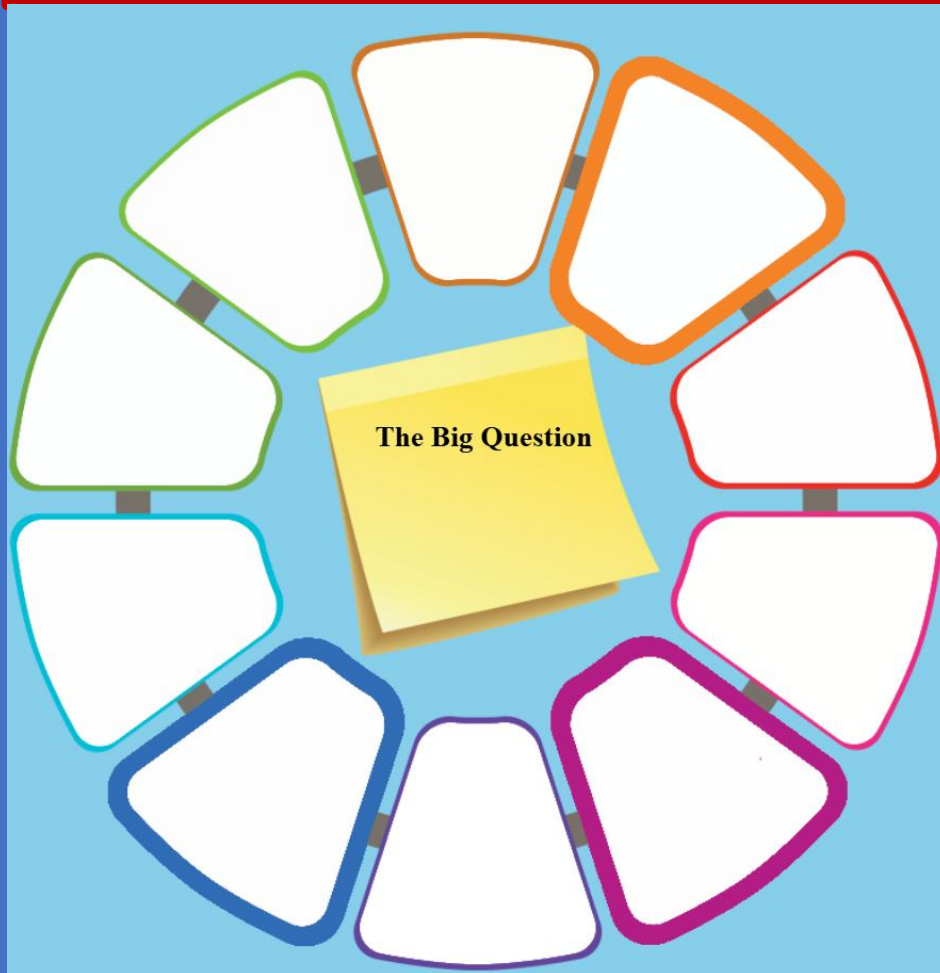


Creating a Discipline Wheel

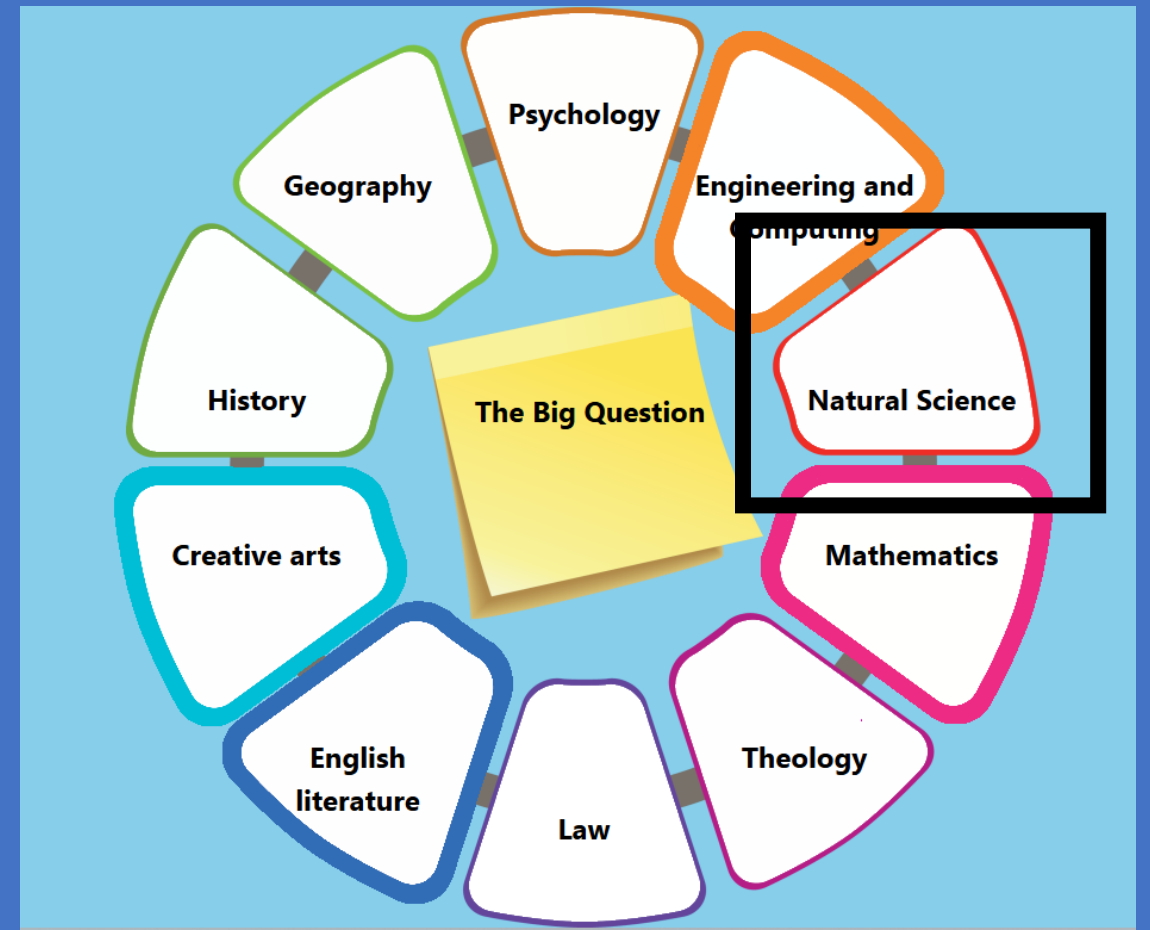
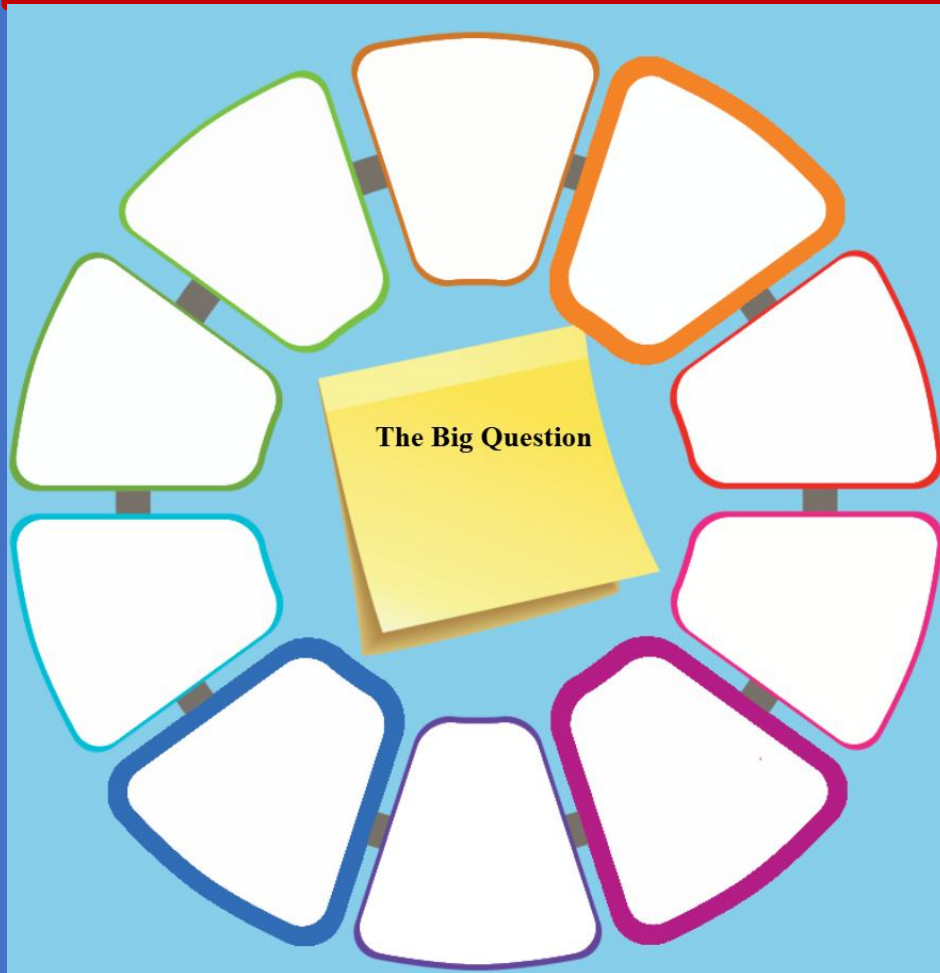
- Using the template provided, have a go at creating your own Discipline Wheel
- What disciplines do you find important? Use in your teaching?



The DW tool can be edited, you can change which disciplines to show



Let's focus on Science!



Example: Thinking like a scientist ...

- Hands-on activities in the classroom that focus on observation
- Learning about the ways that astronomers and scientists gather observations to answer puzzles about the universe



Can water flow uphill?

- What do you think?



Can water flow uphill?

Engineering – How can we use technology to move water up hill?

Geography - Where on Earth can we find water that seems to flow uphill?

Science - How can we make water move upwards without pouring it or using a pump?

The collage features several images and a central diagram. At the top left is a photo of a manual water pump in a dry, hilly landscape. To its right is a text box asking 'How can we use technology to move water uphill?'. Further right is a photo of a large geyser erupting with the text 'we can see water moving uphill?'. Below the geyser is a text box asking 'Some materials can soak up water - but how high can it go?' next to a photo of a blue cloth being pulled out of a beaker of blue liquid. At the bottom right is a diagram of a water tower with the text 'When water evaporates it moves upwards. Is it still water while it is in this state?' next to a beaker of water. In the center is a circular diagram with a yellow sticky note in the middle that says 'Can water flow uphill?'. The sticky note is surrounded by ten colored segments, each representing a different field of study: Science, Geography, History, Chemistry, Languages of the World, Physics, The Arts, Philosophy, Engineering and Computer Science, and Mathematics.

How can we use technology to move water uphill?

we can see water moving uphill?

Some materials can soak up water - but how high can it go?

When water evaporates it moves upwards. Is it still water while it is in this state?

Can water flow uphill?

Science

Geography

History

Chemistry

Languages of the World

Physics

The Arts

Philosophy

Engineering and Computer Science

Mathematics

Can water flow uphill?

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Geography - Where on Earth can we find water that seems to flow uphill?

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The collage features several images and a central diagram. At the top left is a photograph of a manual water pump in a dry, hilly landscape. To its right is a photograph of a large geyser erupting with a massive plume of white steam. Below the geyser is a photograph of a blue liquid being drawn up a tube into a glass. At the bottom right is a diagram of a beaker with water and steam rising from it. In the center is a circular diagram with a yellow sticky note in the middle that reads 'Can water flow uphill?'. The sticky note is surrounded by ten colored segments, each representing a different field of study: Science (orange), Geography (blue), History (red), Chemistry (dark blue), Languages of the World (purple), Physics (dark blue), The Arts (light blue), Philosophy (light blue), Engineering and Computer Science (dark blue), and Mathematics (green). Text overlays include: 'How can we use technology to move water uphill?' near the pump, 'we can see water moving uphill?' near the geyser, 'Some materials can soak up water - but how high can it go?' near the tube experiment, and 'When water evaporates it moves upwards. Is it still water while it is in this state?' near the beaker diagram.

Science and Observation

Children place different types of paper (kitchen roll, newspaper, writing paper) into a glass of coloured water and observe how high the water travels up each type of paper over time.

They measure the height the water reaches with a ruler.



Science Enquiry

Talk about Observation



Favourite Science Activity?

- What's your favourite 'hands-on' science activity for teaching that observation is at the heart of science?



Will We Ever Live on Mars?

**Teaching Children How Scientists Use
Observations to Study Planets and
Collaborate Across Disciplines to Explore
Space Living**

Comparing images of Mars and Earth:



What do you notice?

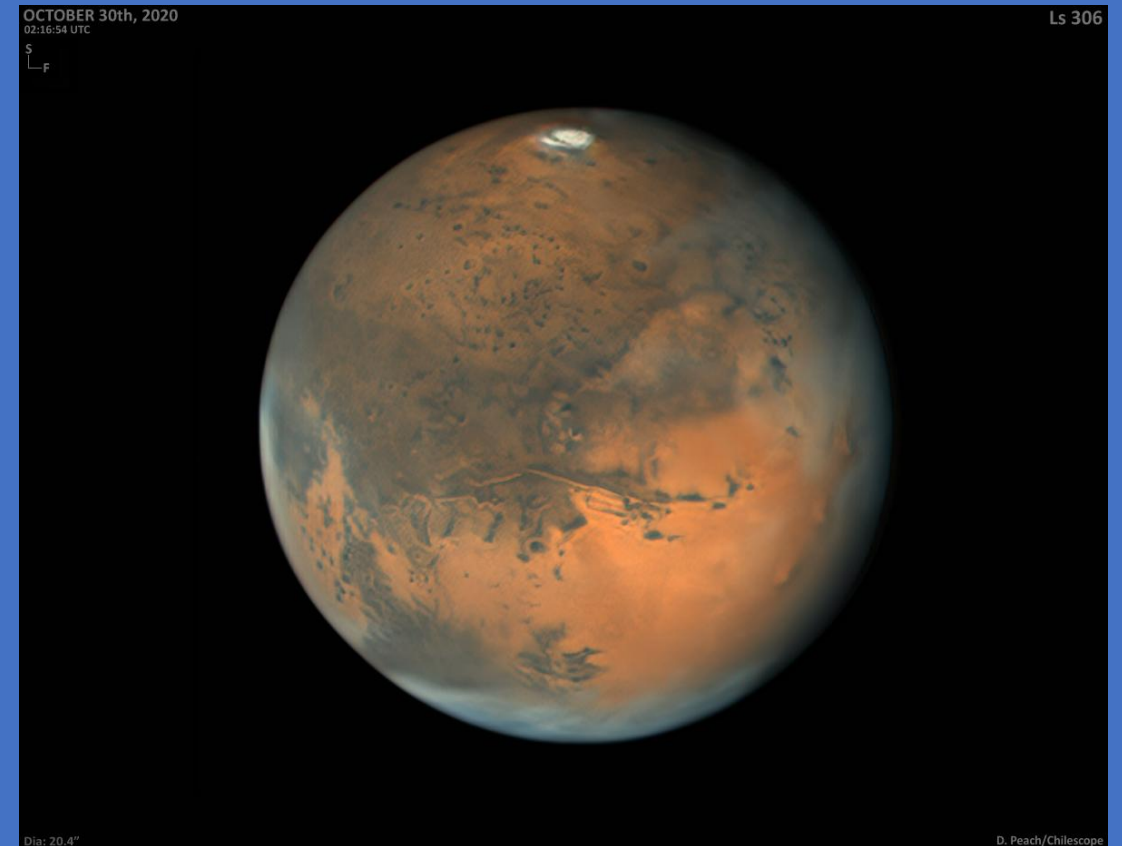
Earth is sometimes called the Blue Marble...



- Did you know, 70% (over half) of the Earth's surface is covered by water.
- From space, Earth looks like a blue marble – satellites orbiting the earth capture its 'blue' oceans, brown continents and white swirly clouds.

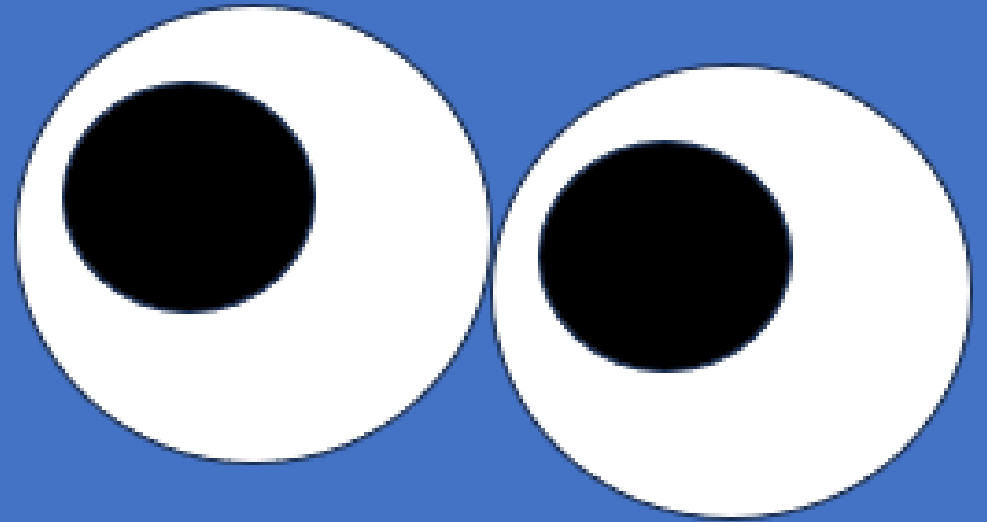
Mars – the 'Red Planet'

- Mars is the closest planet to Earth in terms of livable conditions
- It's red because of the rust in the soil
- Long ago, Mars had water on its surface – including rivers and lakes. Today the surface is 'dry' – and it never rains. But there is still frozen water at the poles.



Science – including Astronomy

- When we think like a scientist – we are thinking about the natural world and using observations to get and test ideas.
- Observation is at the heart of science – it matters more than experiments!
- And in astronomy – it's ALL about observing – we can't easily do experiments in space!



Mars Missions

Can humans live on Mars? This Nasa mission intends to find out

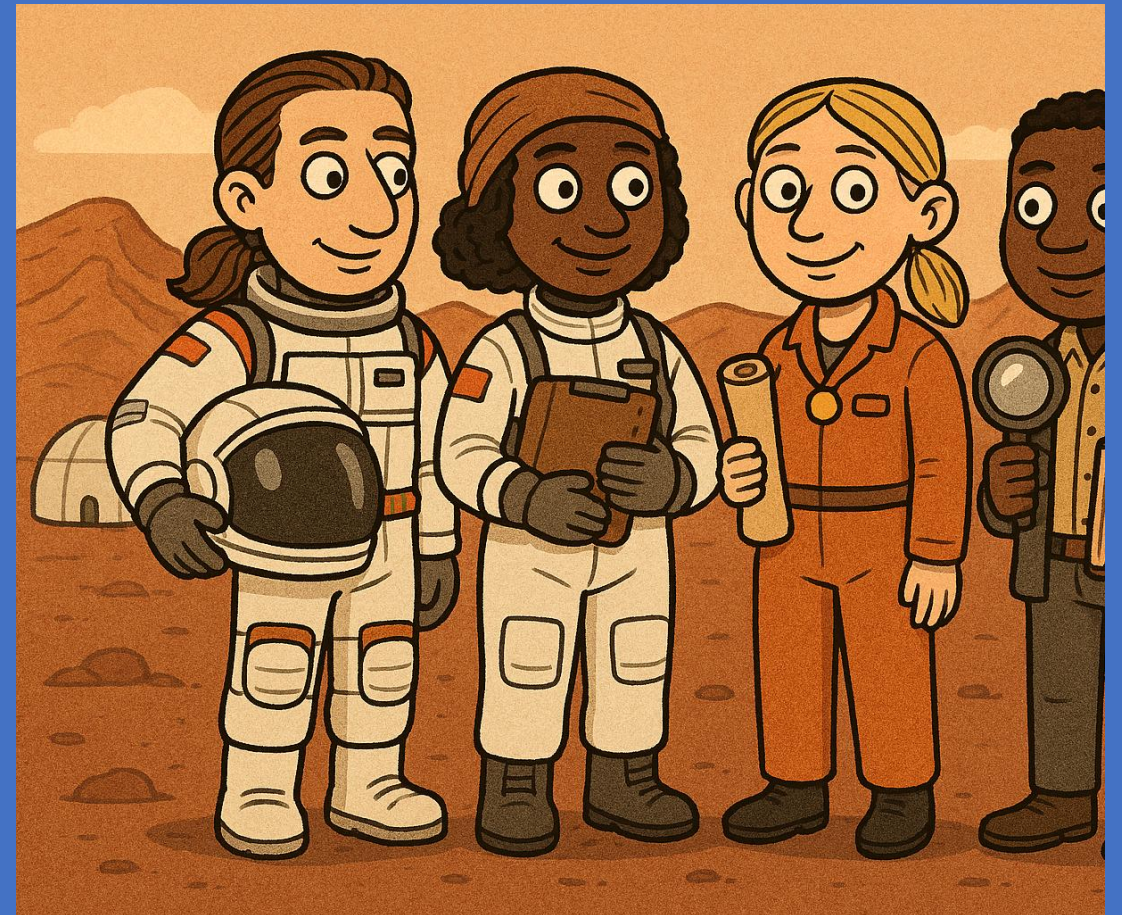
A crew in Houston, Texas is undertaking a 378-day mission mimicking the conditions on the Red Planet, with the goal of shaping future trips

Starship to launch today in latest test of Musk's Mars-bound rocket

World's biggest rocket will lift off on Monday evening after last three attempts ended in explosions

Mars Mission Specialists!

- The International Space Agency needs YOUR team to create the first town on Mars.
- These brave astronauts will depend on your decisions to survive. Get it right, and you'll make history. Get it wrong, and... Well, let's not think about that!



Experts working together

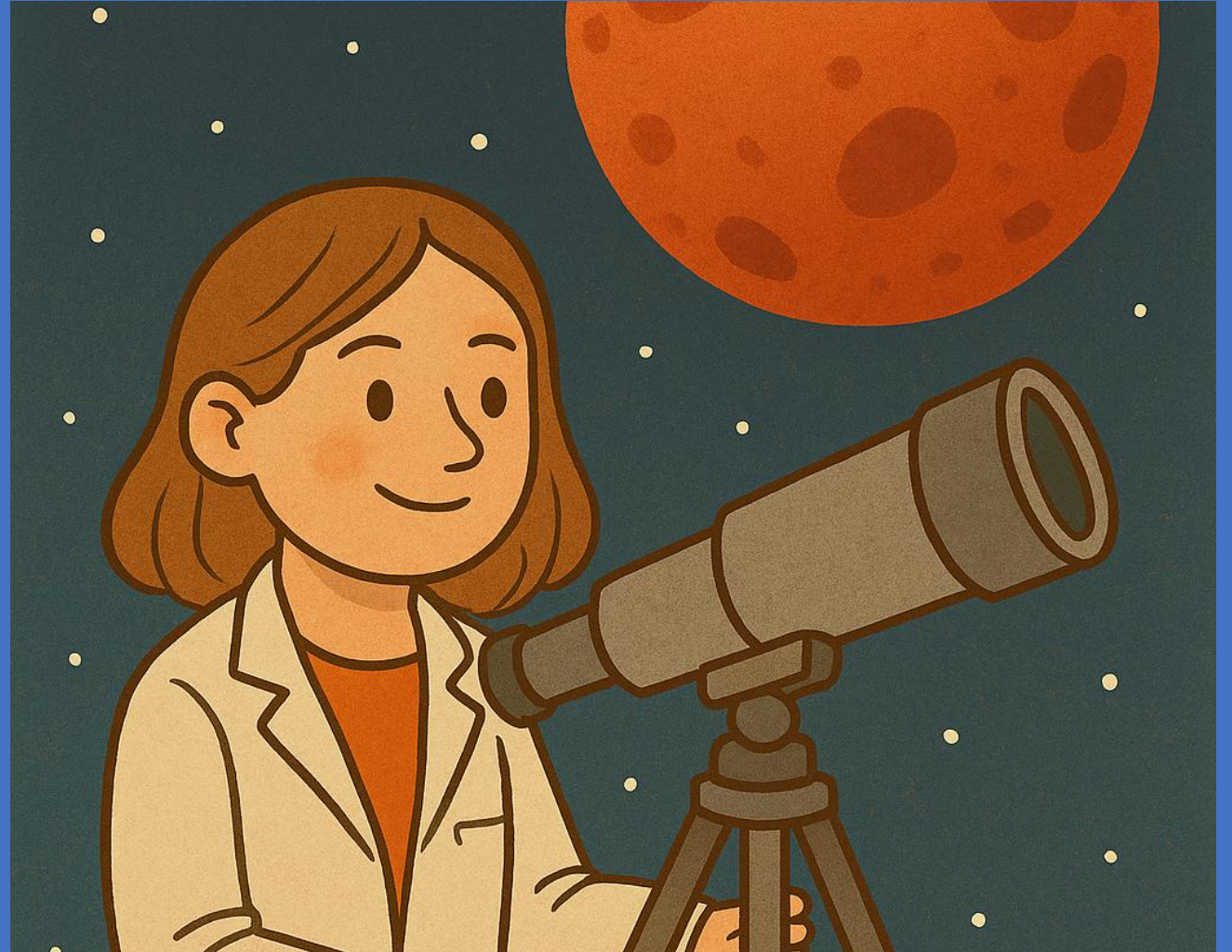
- A complicated mission or question – like how will we live in Mars – calls for people with different interests and professions to work together



Mars + Science

*A scientist might ask
"Which parts of Mars are
safest for humans to live?"*

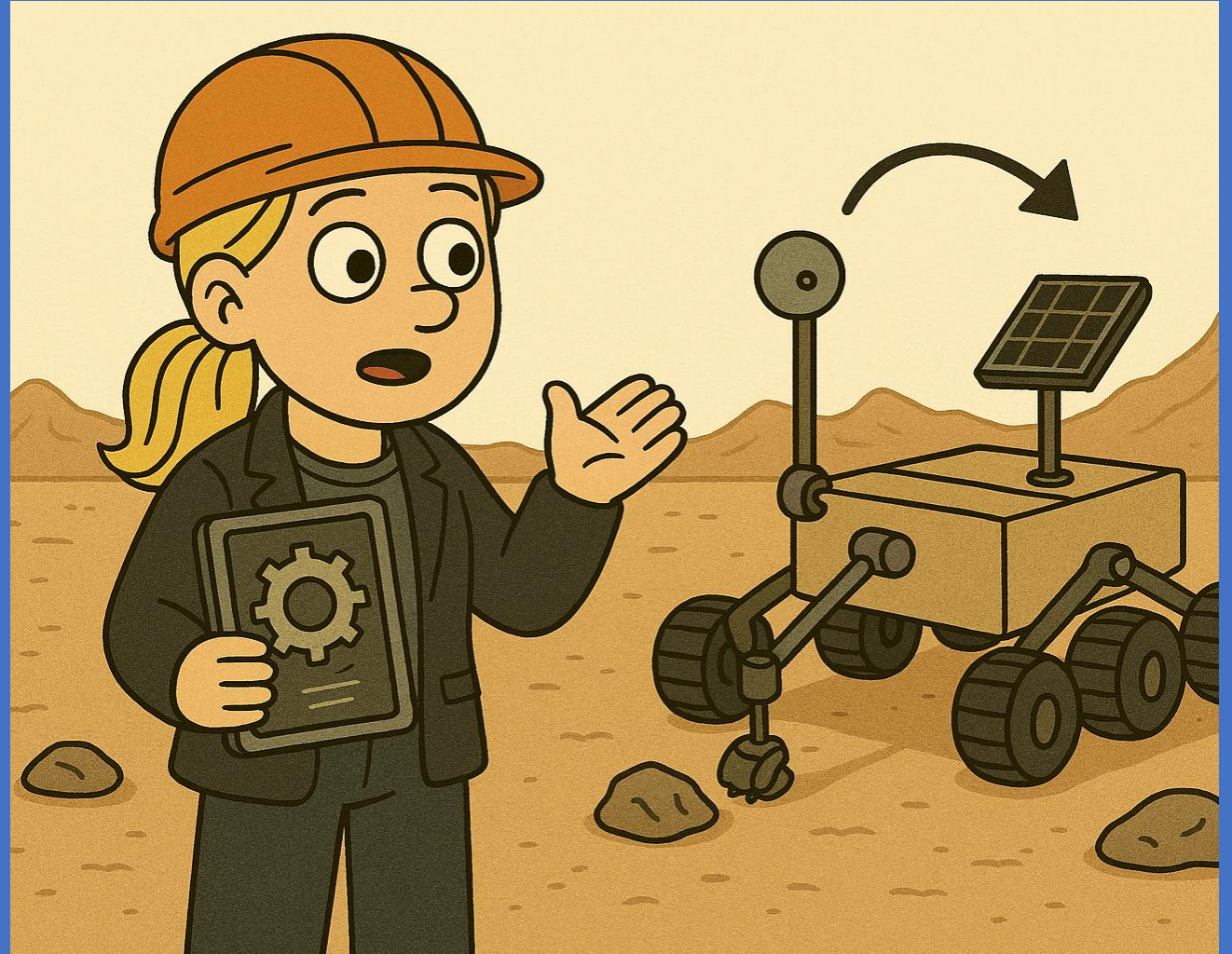
They can't visit Mars (yet!) but they can use special scientific tools to observe and explore Mars, and learn more about what it might be like to live there.



Mars + Computing

A Computer Engineer might ask: "How do we program a Mars rover to collect data about Mars?"

Mars Rovers are robots that can help us explore new regions for us to live and send information to the astronauts and earth



Mars + Art

An artist might ask "How can I show what life on Mars might look like?"

Artists can help us design places to live that keep people safe on Mars, as well as being nice places to sleep, eat, work and play



Will we live on Mars? Interactive Tool

Will We Ever Live on Mars?

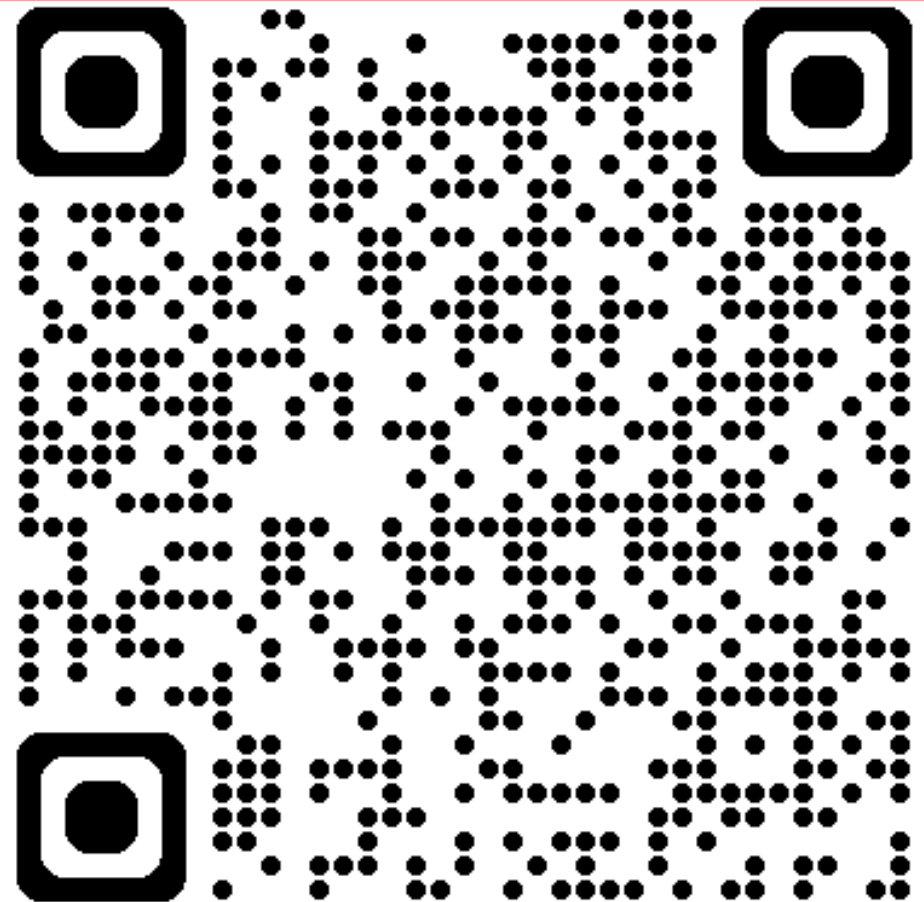


What is Mars?

Mars is the fourth planet from the Sun, often called the "Red Planet" because of its rusty colour. It's about half the size of Earth, with a day that lasts 24 hours and 37 minutes. Mars has an atmosphere that's much thinner than Earth's and gravity that's weaker than ours.

Give it a go!

- Try out the tool and explore the Discipline Wheel for our Big Question about Mars
- When you're done, there's a short survey to tell us about your experience of the tool, and any improvements you would like to see
- Can use mobile or go to **<https://will-we-live-on-mars.vercel.app>**



Any feedback?

- A short survey about your experiences of using the tool, and how you might use it in the classroom
- Or Email the Lead Investigator Professor Berry Billingsley
Berry.Billingsley@swansea.ac.uk

Teacher Feedback: "Will We Ever Live on Mars?" Website

