Solar System Explorers

TEACHER GUIDE

Australian Space Discovery Centre

This activity is designed for Year 6 Science classes, or Year 5/6 Design and Technology classes.

This activity will give students an introduction to the planets in our Solar System. They will use their knowledge of what humans need to survive and compare this to the unique conditions on other planets. They will investigate the reasons for which life cannot currently be sustained on other planets in our Solar System. Students will apply their learning to design and build a vehicle capable of exploring a planet of their choice.

Duration: One lesson, or two lessons if students craft a model of their planet-exploring vehicle.

Resources:

- Planet Fact Files - Print a few copies of this document if students are working individually. One copy of this document is sufficient if students work in groups.
- NASA's Eyes: Solar System Interactive https://eyes.nasa.gov/apps/solar-system/ launched on class screen
- Crafting materials eg:
  - shoeboxes
  - aluminium foil
  - cardboard cylinders (e.g. paper towel)
  - paper plates / cups
  - paper straws
  - pipe cleaners
  - decorative materials

Example of a planet-exploring vehicle. Plants have been included to help the astronaut breathe. Big wheels help the vehicle get over rocks and craters on Mercury.

This example is modified from a visitor's work.

Learning Intentions & Curriculum Links

Learning Intentions

Students will…

- Consider what humans and human-like life needs to be able to survive
- Understand other planets are different from Earth and different from each other, and what causes those differences
- Understand technology can be (and is) used to allow exploration
- Use design thinking to create a planet exploring vehicle

Australian Curriculum V9 | Years 5 and 6

Note: this workshop has been designed to align with the Australian Curriculum Version 9.

Connections to a range of Learning Areas and General Capabilities are included to highlight content relevance and possible learning applications in the classroom.

Science - Science Understanding (Year 6)

Earth & Space Sciences: Describe the movement of Earth and other planets relative to the sun and model how Earth's tilt, rotation on its axis and revolution around the sun relate to cyclic observable phenomena, including variable day and night length. AC9S6U02.

Chemical Sciences: Explain observable properties of solids, liquids and gases (in the context of Terrestrial and Jovian planets). AC9S6U04.

Biological Sciences: Investigate the physical conditions of a habitat and analyse how the growth and survival of living things is affected by changing physical conditions. AC9S6U01.

Design and Technologies - Processes and Production Skills (Year 5/6)

Generating and designing: Generate, iterate and communicate design ideas, decisions and processes using technical terms and graphical representation techniques, including using digital tools. AC9TDE6P02.

Producing and implementing: Select and use suitable materials, components, tools, equipment and techniques to safely make designed solutions. AC9TDE6P03.

Learning Intentions & Curriculum Links

General Capabilities — Years 6

Capabilities: Critical and Creative Thinking (v9)
Inquiring: Develop questions; Identify, process, and even evaluate information
Generating: Create possibilities; Consider alternatives
Analysing: Interpret concepts and problems; Draw conclusions and provide reasons; Evaluate actions and outcomes
Capabilities: Literacy (v9)
Speaking and listening: Listening; Interacting; Speaking
Reading and viewing: Understanding texts
Writing: Creating texts
Capabilities: Ethical Understanding (v9)
Understanding ethical concepts and perspectives: Explore ethical concepts; Recognise influences on ethical behaviour and perspectives
Responding to ethical issues: Explore ethical issues; Make and reflect on ethical decisions
Capabilities: Personal and Social Capability (v9)
Social Awareness: Community awareness
Social Management: Communication; Collaboration; Decision-making

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LAUNCH

Ask students if they have ever thought of going to space? What do they want to know? What do they think they would find?

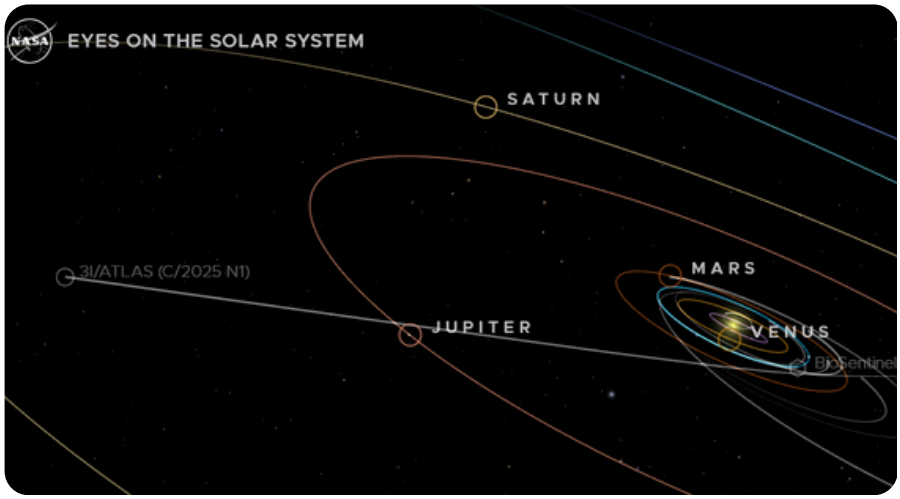
Ask students what they know about what humans need to survive? (Prompt for food, water, shelter, air if needed.) Record student responses.

What if humans needed to find another planet to live on? How would we travel there and what would we need to survive? Could any of the other planets in our Solar System support human life?

Explain that students will investigate one planet in our Solar System to explore. They will design a vehicle that could explore the planet and gather data about the potential for human habitation.

DISCOVER

Project NASA Eyes on Solar System https://eyes.nasa.gov/apps/solar-system/ on the class screen. Select and zoom to explore facts about each planet contained in the “Info” tab of the website. Use discussion points on the next page.



Eyes on Solar System
Credit: NASA/JPL

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DISCOVER

Discuss features and facts of each planet as a class. Guide students to consider human survival needs, such as:

- Temperature
  - Ask: Where in the solar system would we find it too hot? Why would these places be too hot? *(e.g: Venus (464 °C) or Mercury (167 °C) average temperatures)*
  - What about too cold, and why? *(e.g: Use Jupiter (-110 °C) or Neptune (-200 °C))*
- Air and Atmosphere
  - Where might we find there's not enough air?
  - Where might there be an atmosphere we can't breathe? *(e.g Mars' atmosphere is 100 times thinner and is 95% Carbon Dioxide. We cannot breathe on the Martian surface without help.)*
- Pick 2-3 planets with features that haven't been addressed yet for very brief discussion.
  - Jupiter/Saturn: surface *(Could we stand on a gassy (Jovian) planet?)*
  - Neptune/Uranus: energy (dim sunlight), surface (Ice giants), weather
  - Mercury/Mars: dust, craters, weaker gravity, temperature variations, stronger radiation

"We are nicely adapted to live on Earth, and as you've pointed out to me, it's difficult to survive in other places. But, humans, we like to explore, to discover, to find new things. In a moment, I'll ask you to **choose a planet you'd like to explore and think about three things that will make it difficult to visit there**. While you're thinking of those things, you might also want to think about whether you'd like to visit it yourself, or if you want to get a robot — a rover — to do it for you.

Once you've thought of three things that will make it difficult to visit that other planet, **design a planet exploring vehicle and think about what you'll need to include to get around those three difficult things."**

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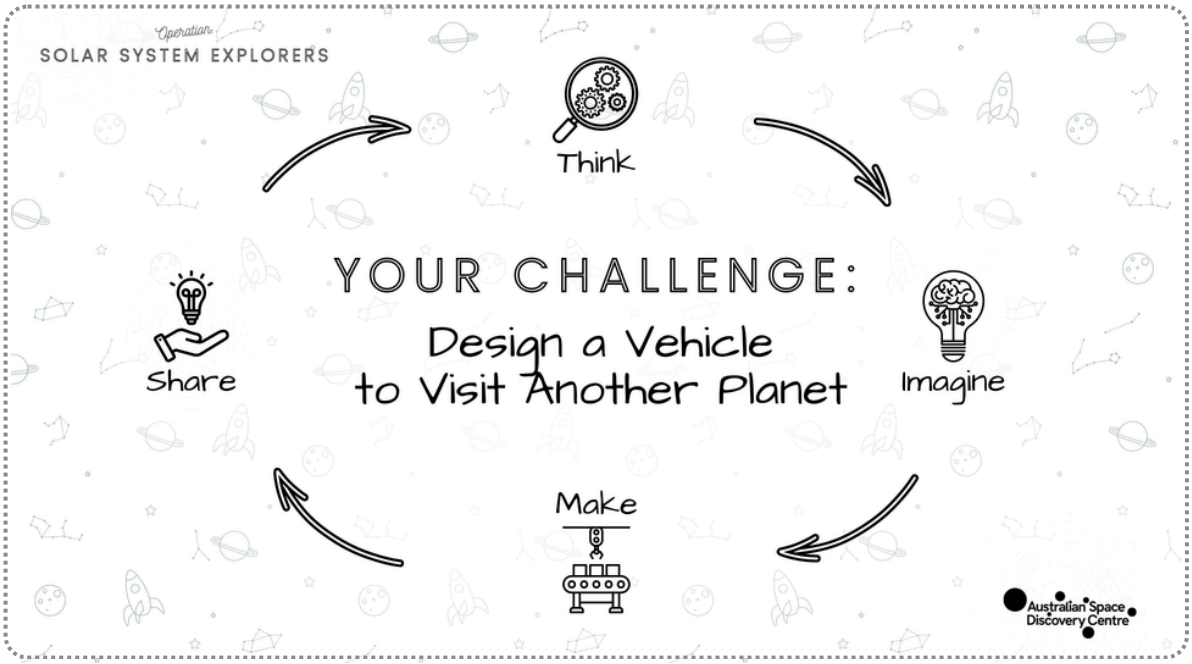
DESIGN TASK



Introduce and commence design task following the design cycle depicted above.

Think: Students choose a destination, collect the corresponding printed "Planet Fact File", and identify the problems they need to consider.

Imagine: Students imagine a planet exploring vehicle and think about what they'll need to include to get around those three difficult things.

Make: Students draw a design of their vehicle, labelling the parts.

Optional: Students use craft materials to make a model of their space exploring vehicle, including special features to help them (or their robot) survive on the planet they've chosen.

Share: Students share their designs with peers.