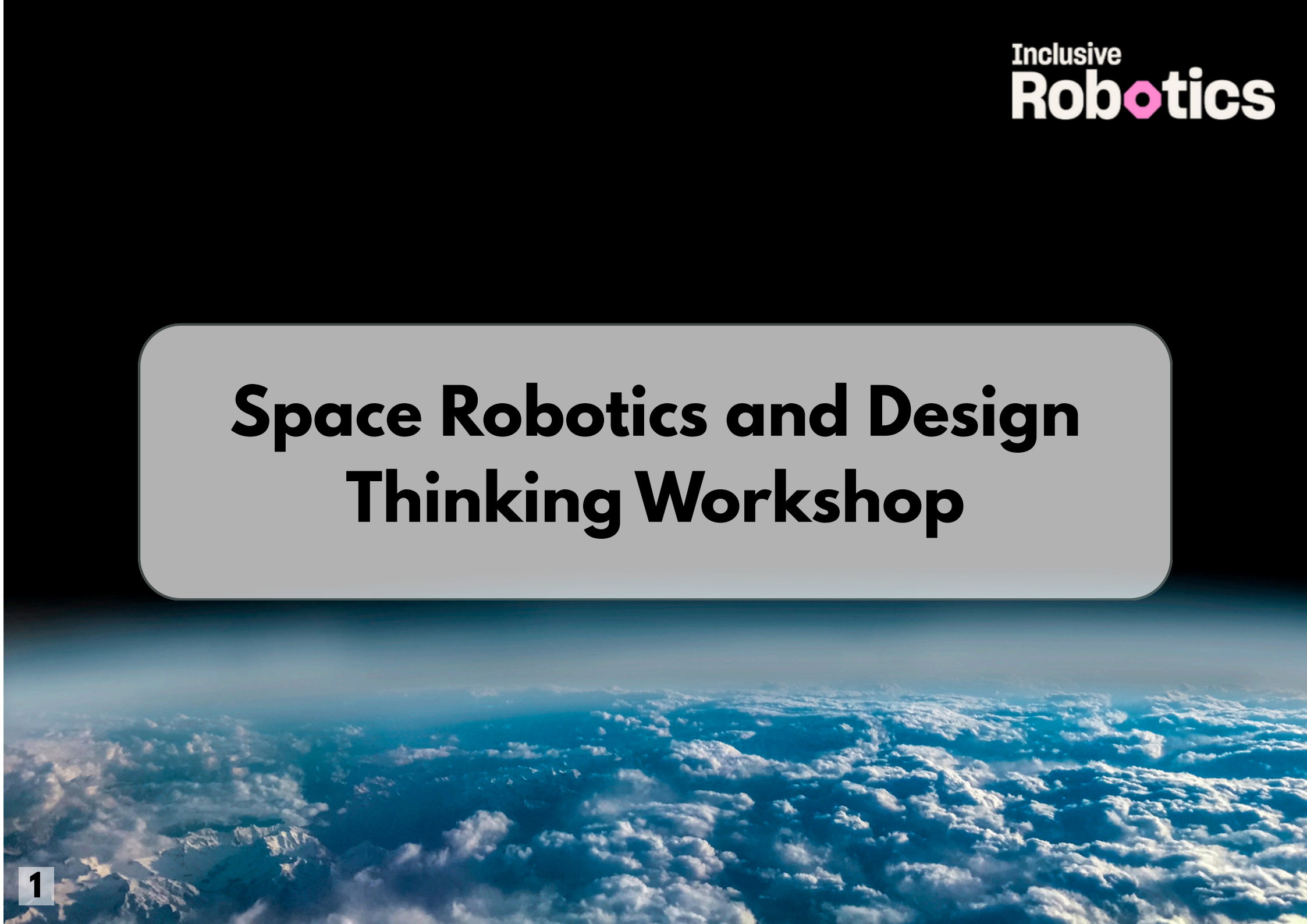
Inclusive Robotics

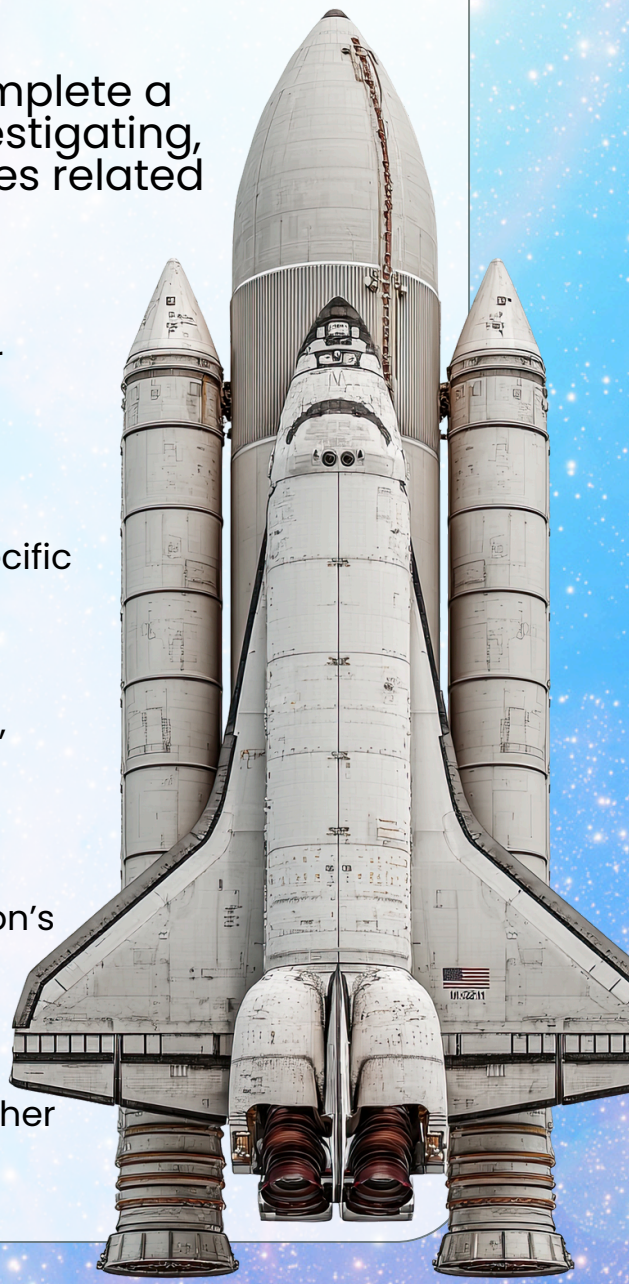
Space Robotics and Design Thinking Workshop





STEM: SCIENCE TECHNOLOGY ENGINEERING MATHEMATICS

Over the course of the term, you will complete a series of space missions that involve investigating, designing, building, and solving challenges related to space exploration.



WEEK 1
MISSION

SPACE OBJECT INVESTIGATION

Use augmented reality to explore planets up close and discover features like a real space scientist.

WEEKS 2-3
MISSION

PLANET SURFACES INVESTIGATION & LANDER DESIGN

Investigate different planetary surfaces and design a lander prototype that can safely touch down or navigate around a specific planet's terrain or atmosphere.

WEEK 4
MISSION

ROCKET LAUNCH

Design and test a straw rocket to see how thrust, aerodynamics, and stability affects flight.

WEEKS 5-7
MISSION

MOON BASE SUPPLY DELIVERY ROBOT

Build and program a robot to transport supplies across the moon's rough surface to support a lunar base.

WEEKS 8-9
MISSION

SPACE STOP MOTION

Create a stop motion animation that shows how planets and other space objects move and interact in our Solar System.

WHAT IS AUGMENTED REALITY?

Augmented Reality (AR) is a technology that uses a tablet or phone to add digital images, animations, or information to the real world. The screen shows 3D objects that look like they are sitting on or moving right in front of you, even though they are computer-generated. This lets you explore things that would normally be too big, too small, too far away, or impossible to see in real life.

QuiverVision

We are using **Quiver Vision.**
Quiver Vision works by combining coloring pages with Augmented Reality (AR) technology via a smartphone or tablet app. The Quiver app scans the page, recognises the pattern and maps the your colours onto a 3D model. Then the 3D model comes to life on the screen in the same colors as your drawing.

MISSION

For your first mission, you will use Quiver to explore our Solar System and answer the questions on pages 4 - 6 of this booklet.

MISSION: SPACE OBJECT INVESTIGATION

Astronauts and space scientists, your mission is to explore mysterious objects in space using Augmented Reality technology. Quiver will allow you to examine planets, moons, and other space objects up close. Your task is to observe carefully, think like a scientist, and report your discoveries back to Mission Control. Record your notes in the space below:

MISSION TASK 1: OBSERVE AND DISCOVER

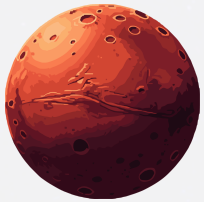


What is this planet?

_____

Distance from the sun: _____

What is the red spot? _____



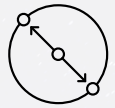
What is this planet?

_____

An interesting fact about it: _____

_____

MISSION TASK 2: PLANET SIZE



Which planet has the **largest** diameter?

_____ years

Which planet has the **smallest** diameter?

_____ years

MISSION TASK 3: MAKE CONNECTIONS

Which planet is the most similar to Earth? Why?

_____

_____

_____

_____

MISSION TASK 4: THINK LIKE A SCIENTIST

Choose one planet to focus on. Make notes about what you observe. Think about...

- Why are you interested in this planet?
- Is it rocky, icy, or made of gas?
- Predict whether it would be hot, cold, or both.
- Determine whether humans could stand on it
- What features does it have? Think about craters, clouds, moons, rings etc.
- Identify where it is located within the Solar System.
- Write some questions you have about this planet.

You can continue your notes on the next page.

Sketch your planet here

DID YOU KNOW?

Space dust might look tiny, but it's the material that helped form planets and moons. It's still drifting through space today!



MISSION : SPACE OBJECT INVESTIGATION

Use this page to take notes during your mission

RECENT MOON LANDINGS

WHO HAS EXPLORED THE MOON LATELY?



In August 2023, India landed a spacecraft on the Moon as part of the **Chandrayaan 3 mission.**

This was a huge achievement because it landed near the Moon's south pole, a place no country had landed before.

What landed on the moon?
he mission had two main parts:

- Vikram Lander – safely touched down on the Moon
- Pragyan Rover – a small robot that rolled around exploring the surface

What did it do?
The rover and lander collected important information by:

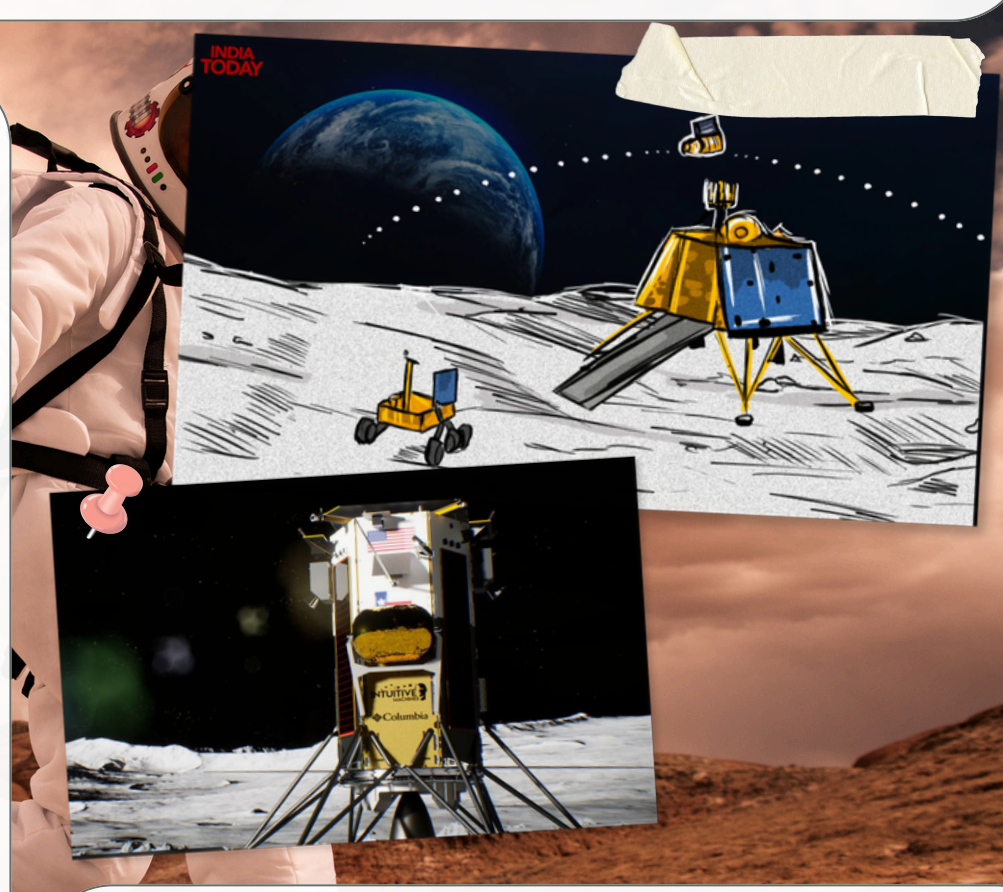
- Measuring the temperature of the Moon's soil
- Studying moon rocks and dust (regolith)
- Looking for clues about water ice



In February 2024, the USA landed a spacecraft called **Odysseus** near the Moon's south pole.

This mission Measured how dusty the Moon surface is

- Tested navigation and landing technology
- Collected data to help future astronauts land safely





WHY DO WE WANT TO LEARN MORE ABOUT THE MOON?

- To learn more about the Moon's history
- To find water ice
- To prepare for humans to live there in the future

MISSION: PLANET SURFACES INVESTIGATION & LANDER DESIGN

Space agencies must design landers that can safely touch down on very different planetary surfaces, from dusty, rocky Mars to icy moons and crater-covered terrain.

Your mission is to investigate how surface conditions affect landing and then design a lander that can protect its cargo during touchdown.

MISSION PHASE 1: SURFACE INVESTIGATION

Read each of the planet surfaces posters then select one to focus on as a group.

What surface features will you need to consider in your design?

1

2

3

Sketch your planet. Label important features.

MISSION : PLANET SURFACES INVESTIGATION & LANDER DESIGN

Space engineers design landers to absorb impact, navigate terrain, stay upright, protect important equipment, and communicate with scientists on Earth. Design and build a space lander/explorer prototype that is build specific for the planet you chose.

EXAMPLE

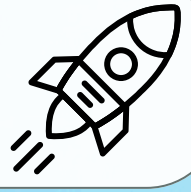


This vehicle was built to explore Venus:

- Clear shell of main chamber for increased visibility during wind and dust storms. Metal wings absorb any heat and then the pipes inside them transfer this heat to the main chamber.
- Wings and no landing ability to explore the gas surface of the planet.

Draw and label your prototype design here:

MISSION: ROCKET LAUNCH



Scientists and Engineers are always testing and improving their designs. After making your rocket, record the distance it travelled in your data log.
Can you make your rocket fly further? Try different rocket lengths, fin shapes, fin sizes, or fin angles. For every launch, record each design change and distance in your data log.

DATA LOG

Test Number	Distance travelled	Changes made to the design to improve it
1		Original design
2		
3		
4		
5		
6		
7		

MISSION: MOON BASE SUPPLY DELIVERY ROBOT

MISSION PHASE 1: CRATER FORMATION EXPERIMENT

Before robots can safely travel on the Moon, scientists must understand how craters form. Your mission is to investigate how the height from which a rock falls affects the size of the crater it creates on a Moon-like surface.

Investigate the relationship between drop height and crater size by collecting and analysing data.

Predict: What do you think will happen to the size of the crater as the height increases? Why?

Each time you drop the rock from a height, observe the crater carefully. Measure the diameter and record your measurement, then smooth the surface before the next trial.

Height rock dropped from	Diameter of crater
5cm	
10cm	
15cm	

Height rock dropped from	Diameter of crater
20cm	
25cm	
30cm	

MISSION: MOON BASE SUPPLY DELIVERY ROBOT

The Moon's cratered surface creates hazards for landing spacecraft and travelling robots. Design and build a robot capable of delivering supplies across the moon's surface.

MISSION PHASE 2: BUILDING A LUNAR ROBOT

DID YOU KNOW?

The Moon is covered in fine dust called **regolith**

It can stick to surfaces and make it harder for robots and astronauts to move around.

Your robot should:

- [ ] Carry a package securely
- [ ] Move across uneven ground
- [ ] Avoid getting stuck or tipping over
- [ ] Fit within the materials and parts provided

Code your robot to complete the mission autonomously (without being touched during the run). While testing, observe:

- [ ] Does the robot travel in the correct direction?
- [ ] Does it maintain control on rough terrain?
- [ ] Does it avoid obstacles?
- [ ] Does it deliver the package successfully?
- [ ] What problems occur?

MISSION : MOON BASE SUPPLY DELIVERY ROBOT

The Moon's cratered surface creates hazards for landing spacecraft and travelling robots. Design and build a robot capable of delivering supplies across the moon's surface.

Draw and label your robot design here:

MISSION: SPACE STOP MOTION ANIMATION

Scientists use models and animations to explain how objects move and interact in space. Your mission is to create a stop-motion animation to communicate your understanding of space.

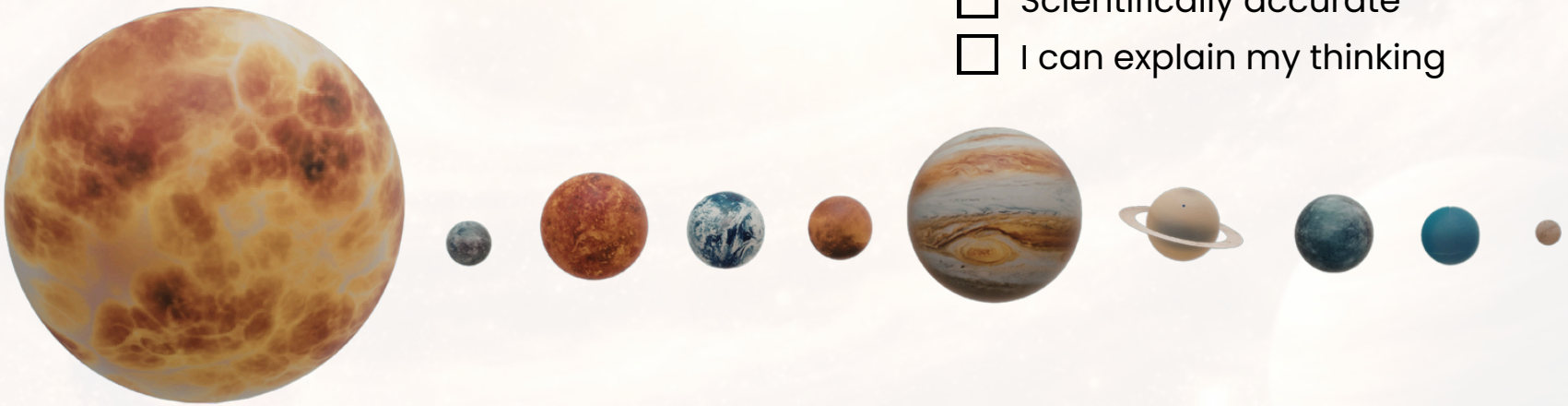
Stop motion is a type of animation that is made by taking many photos of objects moved slightly each time, so it looks like they're moving when the images are played in sequence quickly.

OPTION 1: SOLAR SYSTEM ANIMATION

Create a stop-motion animation showing the eight planets orbiting the Sun in the correct order and demonstrating how they move through space.

MISSION CHECKLIST:

- ☐ All eight planets are included
- ☐ Planets are in the correct order from the Sun
- ☐ Planets orbit the Sun
- ☐ Movement is clear and smooth
- ☐ Key features are visible



OPTION 2: OPTION 2: YOUR SPACE INVESTIGATION

Create a stop-motion animation that shows a space concept, question or idea you are curious about.

MISSION CHECKLIST:

- ☐ Clear space idea or question
- ☐ Creative choices shown
- ☐ Movement or change is clear
- ☐ Scientifically accurate
- ☐ I can explain my thinking

Victorian Curriculum Links

Science

Strand	Content Descriptor	How it Links
Science Understanding: Earth & Space Science	The force of gravity keeps Earth and other planets in the solar system in orbit around the Sun; cyclic observable phenomena, including variable day and night length, can be related to Earth's tilt, rotation on its axis and revolution around the Sun. VC2S6U07	Students explre how the Sun's gravity keeps planets in orbit and represent Earth's movements (rotation and revolution) through models and animation s of the Solar System.
Science as a Human Endeavour	Scientific knowledge changes over time, often resulting from collaboration or by building on the work of others, and leads to advances in science. VC2S6H01	Students recognise that space exploration relies on collaboration between scientists and engineers, building on prior knowledge to develop new technologies and missions.

Design & Technologies

Strand	Content Descriptor	How it Links
Technologies and Society	How people in design and technologies occupations consider competing ethical factors including sustainability in the design of products, services and environments. VC2TDE6S01	Students learn how engineers design solutions that that support human needs in space, such as transportation, landing systems, and living environments.
Materials and Technologies Specialisations	Explain how characteristics and properties of materials, systems, components and tools affect their use when producing designed solutions. VC2TDE6C04	Students select and use materials based on their properties when building prototypes, considering strength, flexibility and suitability for purpose.
Creating Designed Solutions	generate, iterate and communicate design ideas, decisions and processes using technical terms and graphical representation techniques, using manual and digital tools. VC2TDE6C02	Students generate, communicate, and refine design ideas by sketching, building, programming, testing and improving models and robotic solutions.