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# Mission Designer: Journey to a New World!

## Materials Needed

- **For Research:** Computer or tablet with internet access, books about the solar system (optional).
- **For Mission Blueprint:** Large sheet of paper or whiteboard, pencils, colored pencils, or markers.
- **For Probe/Rover/Habitat Construction (Choose your materials!):**
  - Recycled materials: Cardboard boxes, plastic bottles, paper towel tubes, egg cartons.
  - Craft supplies: Aluminum foil, tape (masking and clear), glue, pipe cleaners, straws, construction paper.
  - Modeling materials: Modeling clay or play-doh.

## Learning Objectives

By the end of this lesson, the student will be able to:

- Identify and describe the key environmental conditions of one planet in our solar system (e.g., temperature, gravity, atmosphere, surface).
- Apply knowledge of a planet's conditions to creatively solve problems related to space exploration.
- Design a model of a space probe, rover, or habitat that is suited for a specific planet's environment, and explain their design choices.

## Alignment with Standards (Example: U.S. NGSS)

This lesson creatively explores concepts related to **3-5-ESS1-1** (Earth's Place in the Universe), focusing on using data to describe patterns and differences among objects in the solar system.

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## Lesson Steps (Approx. 60-90 minutes)

### Part 1: The Mission Briefing (10 minutes)

This is where you set the stage and get the student excited. Present this as a top-secret mission!

> **"Greetings, Mission Commander. We have a critical assignment for you. We need to explore a new world in our solar system, but we need your help to design the mission. Your task is to choose a planet, study it, and design the equipment we need to explore it safely. The fate of this mission is in your hands!"**

1. **Choose a Destination:** Ask the student to pick a planet they want to explore (other than Earth). Mars is a great starting point, but let them choose! Venus? A moon of Jupiter like Europa? The choice is theirs.
2. **Define the Mission Goal:** Is the mission to look for signs of life? Study volcanoes? Collect rock samples? Help the student decide on a simple, clear goal.
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Part 2: Planetary Reconnaissance (15-20 minutes)

Now the student becomes a researcher. The goal is not to memorize facts, but to gather "intelligence" for their design.

Guide the student to find the answers to these key questions about their chosen planet using a reliable source like **NASA's Space Place** website or solar system books.

- **Temperature:** Is it scorching hot or freezing cold? Or both?
- **Surface:** Is it rocky, icy, or is it a gas giant with no solid surface to land on?
- **Atmosphere:** Is the air thick, thin, or non-existent? Is it poisonous?
- **Gravity:** Is the gravity stronger or weaker than Earth's?
- **Interesting Feature:** What's one cool thing about this planet? (e.g., The huge dust storms on Mars, the Great Red Spot on Jupiter, the rings of Saturn).

Part 3: The Design & Build Phase (25-40 minutes)

This is the core creative part of the lesson. Based on their research, the student will now design and build a model of a rover, probe, or habitat for their planet.

1. **Blueprint First:** On a large piece of paper, have the student sketch their design. Encourage them to label the parts and explain their function. Ask guiding questions to connect the design to their research:
    - "*Since Mars is very cold, what will your rover need to keep its electronics warm?*" (Heaters, insulation with foil).
    - "*The gravity on your planet is very weak. How will your habitat stay on the ground?*" (Anchors, thrusters).
    - "*Venus has a thick, crushing atmosphere. What shape should your probe be to survive the pressure?*" (Small, spherical, very strong).
    - "*How will your rover get power so far from the sun?*" (Large solar panels, or maybe a radioisotope power source).
2. **Construct the Model:** Using the recycled and craft materials, the student brings their blueprint to life! This is a hands-on activity where creativity is key. The model doesn't have to be perfect; the important part is that its features are based on their research. For example, a rover for a rocky planet might have big, sturdy wheels made from bottle caps, while a probe for Jupiter might be covered in "shielding" (aluminum foil).

Part 4: Mission Presentation (5-10 minutes)

Time for the Mission Commander to present their plan!

1. Ask the student to present their model and explain its features.
2. Encourage them to tell the "story" of their mission: What is its name? What will it do on the planet? What challenges will it face?
3. Celebrate their creativity and excellent problem-solving skills!

Assessment (Informal & Performance-Based)

Assess understanding by observing the student's final presentation and design. Look for:

- **Clear Connection:** Can the student explain *why* they added specific features to their model? For example, "I added these big wheels because Mars is rocky," or "I used foil for insulation because

it's very cold."
- **Problem-Solving:** Did the student identify a challenge posed by the planet's environment and design a creative solution for it?
- **Engagement and Creativity:** Was the student engaged in the process and able to express their ideas creatively through the model and presentation?

Differentiation and Inclusivity

- **For Extra Support:** Provide a pre-printed "fact sheet" for a planet like Mars with the key information (temperature, gravity, etc.) already filled in. You can also provide a simple template for the blueprint with boxes to fill in, such as "Power Source" or "Special Tools."
- **For an Extra Challenge:** Ask the student to design for a more complex environment, like one of Jupiter's or Saturn's moons (e.g., a submarine for Europa's ocean or a flying probe for Titan's atmosphere). They could also be challenged to think about a secondary goal, like how the rover would communicate with Earth.

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