NATIONAL GEOGRAPHIC

RESOURCE LIBRARY
ACTIVITY : 50 MINS

Design a Space Probe

Students imagine they are scientists or engineers designing a new space probe to explore our solar system. They choose a planet, review its weather factors, and use a rubric to gather information, make a plan, modify and/or test their plan, and create their design. Students conduct peer evaluation and revise, publish, and present their designs.

GRADES

6 - 8

SUBJECTS

Earth Science, Astronomy, Meteorology, Engineering, Mathematics

CONTENTS

2 PDFs, 1 Link

OVERVIEW

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For the complete activity with media resources, visit:
http://www.nationalgeographic.org/activity/design-a-space-probe/

Program

WILDEST WEATHER IN THE SOLAR SYSTEM

DIRECTIONS

1. Introduce the mission.

Ask students to imagine they are scientists or engineers designing a new space probe to explore our solar system. Have each student choose a planet as a destination for the probe from this list: Mercury, Venus, Mars, Jupiter, Uranus, or Neptune. Have them use worksheet content from previous Wildest Weather activities to review the weather factors on that planet, including possible extreme weather. Have students list any considerations they can imagine related to the environment and weather on the planet, including what the space probe will look like, what size it will be, and how their probe will travel the distance to reach that destination.

2. Review instruments that measure weather.

Have students review and take notes on the different types of weather instruments they might want to include on their space probes. Ask students to consider how they might need to modify instruments to collect information far from Earth and to withstand the weather on their selected planet. Have students add to their notes.

3. Have students create the design.

Provide each student with multiple sheets of blank drawing paper. Have each student sketch a space probe that lands on or hovers above the chosen planet. Require students to include the following:

- at least three instruments that will measure at least two different weather conditions
- labels of the parts of the probe
- a scale bar or expected measurements of the finished product

Emphasize to students that scientists and engineers make many modifications and changes, even during the drawing stages. Students may determine that certain instruments may interfere with other instruments by either causing inaccurate readings or possibly causing damage. For example: perhaps an anemometer is placed too close to a thermometer. The anemometer could come into contact with the thermometer and break it, or it could cause an inaccurate temperature reading due to the air circulation.

4. Conduct peer evaluation.

Explain to students that the engineering and design process involves a great deal of review. Many people give input into the design of a space probe that costs millions of dollars. Display the Space Probe Design Rubric. Tell students that you will use the rubric to evaluate their finished projects. Allow them to ask questions about it. Then explain that first, students will

seek feedback on the initial design from their peers in class. Distribute copies of the worksheet Space Probe Design Feedback to each student. Then divide students into small groups of up to four. Have each student partner with the others in their group to give and get feedback on their design for about five to seven minutes. The student whose space probe design is being evaluated should complete the worksheet for their probe. They can fill in ideas from their three reviewers as well as their own ideas based on the feedback.

5. Have students finalize their drawings or build models at home.
Have students use the design feedback from peer evaluation to finalize their drawings. Give students the option of working on their designs at home, if they would like to create a three-dimensional model of their probe.

6. Have students name their space probes and write brief descriptions of their designs.
Have each student create a unique name for their space probe and write a brief paragraph describing their space probe and what it does, including any special features.

7. Have students publish or present their space probes.
Hang students' space probe designs in a central place in the classroom. Ask each student to present their design, using their writing and the drawing or model.

Modification

For blind peer evaluations, which may lead to more valuable feedback, label the space probe designs with numbers. If you have more than one class, you can allow one class to evaluate the probes for another class.

Rubric

Use the Space Probe Design Rubric to grade each student's final product, the drawing or model, plus the paragraph description and design review form.

Extending the Learning

Have students build a simple model of the Cassini space probe, using the illustrated assembly instructions and parts on the following web page: NASA: Cassini Solstice Mission—Build a Simple Paper Model.

OBJECTIVES

Subjects & Disciplines

Earth Science

- Astronomy
- Meteorology
- Engineering
- Mathematics

Learning Objectives

Students will:

- design a space probe to measure weather on another planet
- sketch and/or build a space probe
- give and get feedback from peer reviewers
- label and provide measurements for the space probe and instruments

Teaching Approach

- Learning-for-use

Teaching Methods

- Brainstorming
- Cooperative learning
- Hands-on learning
- Research
- Writing

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Learning and Innovation Skills

    - Communication and Collaboration
    - Creativity and Innovation
    - Critical Thinking and Problem Solving
- Critical Thinking Skills
    - Analyzing
    - Creating
    - Evaluating

National Standards, Principles, and Practices

NCTM PRINCIPLES AND STANDARDS FOR SCHOOL MATHEMATICS

• **Geometry (6-8) Standard 4:**
Use visualization, spatial reasoning, and geometric modeling to solve problems
• **Measurement (6-8) Standard 1:**
Understand measurable attributes of objects and the units, systems, and processes of measurement

NATIONAL SCIENCE EDUCATION STANDARDS

• **(5-8) Standard E-1:**
Abilities of technological design
• **(5-8) Standard E-2:**
Understandings about science and technology
• **(5-8) Standard G-1:**
Science as a human endeavor

Preparation

What You'll Need

MATERIALS YOU PROVIDE

- Drawing paper
- Pencils
- Pens
- Rulers

REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per classroom, Projector, Speakers
- Plug-Ins: Flash

PHYSICAL SPACE

- Classroom

GROUPING

- Large-group instruction

BACKGROUND & VOCABULARY

Background Information

Scientists and astronomers are interested in learning more about our solar system. A space probe is an unpiloted, unmanned device sent to explore space. Most probes transmit data from space by radio. Designing or developing space probes, or any type of scientific instrument, is a complex process. Scientists and engineers make many modifications and changes, even during the drawing stages.

Prior Knowledge

["extreme weather conditions", "tools used to measure weather", "the function of space probes"]

Recommended Prior Activities

- Extreme Weather in Our Solar System
- Extreme Weather on Earth
- Measuring Weather
- Space Probes

Vocabulary

Term	Part of Speech	Definition
anemometer	*noun*	a device that measures wind speed.
engineer	*noun*	person who plans the building of things, such as structures (construction engineer) or substances (chemical engineer).
extreme weather	*noun*	rare and severe events in the Earth's atmosphere, such as heat waves or powerful cyclones.
model	*noun*	image or impression of an object used to represent the object or system.
planet	*noun*	large, spherical celestial body that regularly rotates around a star.
solar system	*noun*	the sun and the planets, asteroids, comets, and other bodies that orbit around it.
space probe	*noun*	set of scientific instruments and tools launched from Earth to study the atmosphere and composition of space and other planets, moons, or celestial bodies.
thermometer	*noun*	device that measures temperature.
weather	*noun*	state of the atmosphere, including temperature, atmospheric pressure, wind, humidity, precipitation, and cloudiness.

For Further Exploration

Websites

- Nat Geo Movies: Wildest Weather in the Solar System

FUNDER

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