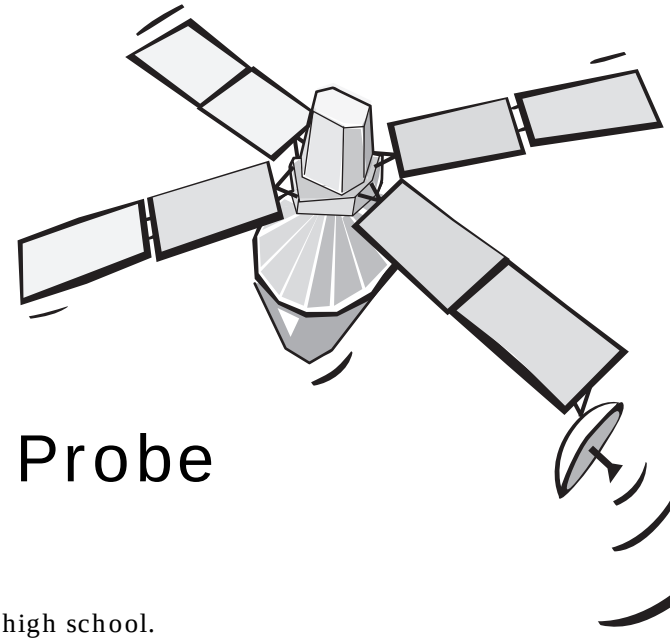
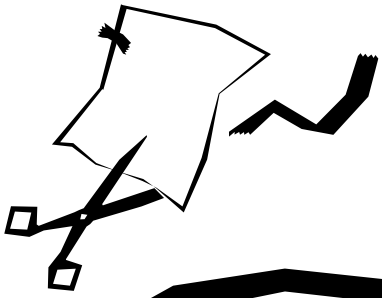
CLASSROOM ACTIVITY



Designing a Planetary Probe

General Information

- ★ Level: grades 5 and 6 and high school.
- ★ Students per group: three or four.
- ★ How long: a few 60-minute periods spread over a week or two.
- ★ Where: classroom.
- ★ Type of activity: research, designing a model.
- ★ Key words: space probe — planet — space exploration.
- ★ Subjects covered: science and technology, language, art.



Summary

In groups, students choose a planet and design a probe while selecting the specific tools to use during a scientific mission on that planet. The groups then create models or plans for their probe and explain their choices to the rest of the class.

Starting Point

Would we send the same type of space probe to the different planets?

Preconceptions

Students mightn't realize that the design of a planetary probe is specific to the characteristics of the world to be explored. Given the physical similarities of different space probes, a student may assume they're all alike and contain the same instruments.

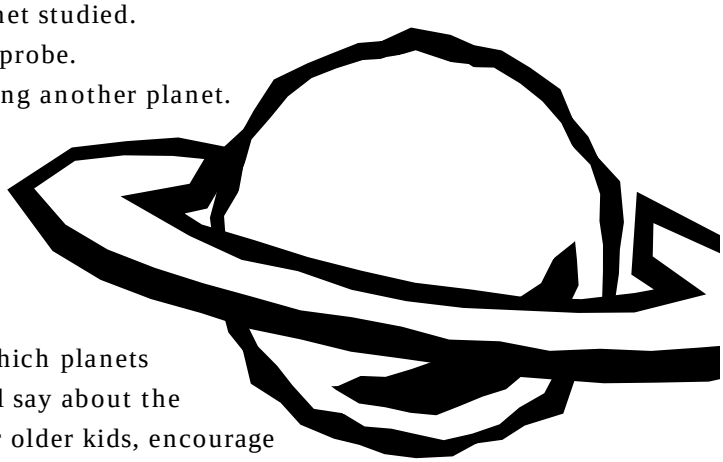
Basic Concepts

This activity is ideal for students who have just learned basic notions about the characteristics of planets, moons and other celestial objects and who now want to imagine that they're really exploring the atmosphere or surface of these worlds. The process for selecting the right tools for the job is the same one that scientists must follow. This activity also encourages co-operation and compromise among group members.

Goals

By the end of this activity, students will be able to:

- Present the main characteristics of the planet studied.
- Understand the main functions of a space probe.
- Explain the use of specific tools for exploring another planet.



Steps in the Activity

Preparations

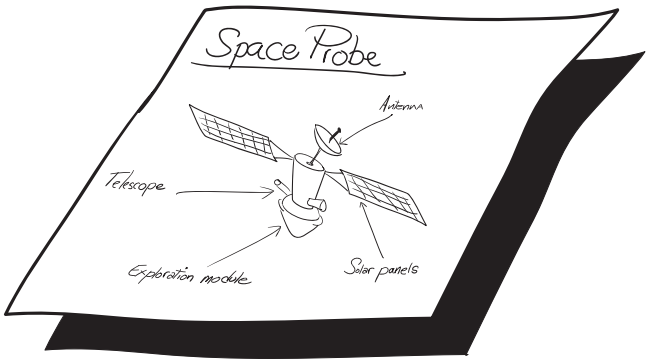
For younger kids, you should perhaps specify which planets to explore, although students will have the final say about the exploration tools they want to use and why. For older kids, encourage them to decide on the goal of their mission before they choose their tools.

A list of tools appears in the student handout, but you can bring to class real samples or review the name and function of each tool. For older students, you can easily add to this list and address more complex notions such as weight or size restrictions, energy supplies and even cost.

Supplies

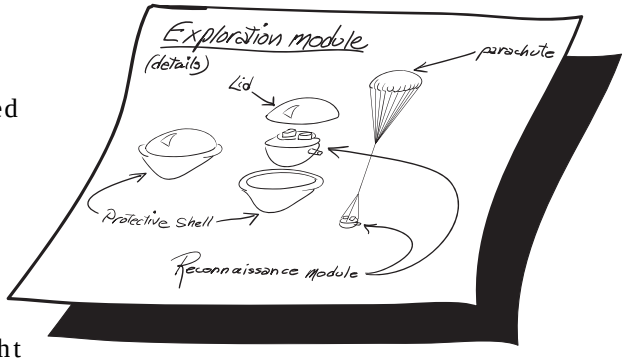
- The enclosed student handout.
- Documentation (books, magazines, websites, CD-ROMs) to help students do research.
- Arts and crafts supplies (pencils, paper, glue, scissors) to help students plan and build their models.

Assignment



❶ Divide your class into eight groups (nine if you want students to design a lunar probe). Each group will be responsible for designing one manned or unmanned probe custom-tailored to a particular planet.

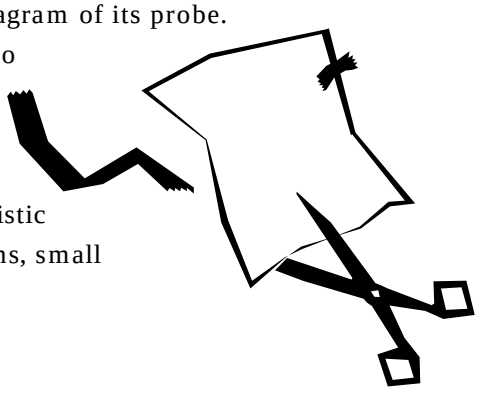
❷ Encourage students to do research in the library or to use other sources of information to gather as many facts possible about the planet they'll explore. Warn them about using outdated sources (more than 10 years old) and suggest they double-check any information found on the Web.



❸ Each group must imagine the type of space probe and the devices and instruments that would be best adapted to their planet. Students should also be prepared to justify their decisions. For greater realism, you could act as the government committee to which each group must submit a proposal citing the estimated costs and justifications for its space probe. You can also impose certain restrictions. For example, you might allow each group to choose no more than 15 of the elements listed in the student handout.

❹ Encourage students to take into account such factors as the feasibility of sending an astronaut to Pluto given how long the journey would take.

❺ After your students have decided on the elements and design of their planetary probes, ask each group to complete a blueprint or cross-section diagram of its probe. The best way to approach this step is to ask each student to draw several components of the probe and then have each group fit the different components together. You might also have group members collect various objects to build a three-dimensional model of their probe (fairly realistic models can be made out of cardboard tubes, empty tin cans, small cardboard boxes, aluminum foil, and poster paint).



Wrap-up

❶ Invite each team to prepare a five- to ten-minute oral presentation to explain the main characteristics of the planet it has studied, the goals of its mission, and the choice of the instruments it has placed aboard its probe. Encourage team members to take turns speaking. The class can then discuss the advantages and shortcomings of each probe.

❷ Organize a mini-exhibition in the class and invite students from other classes to visit. Each team could then present the findings of its research and explain the choice of instruments placed aboard its probe.

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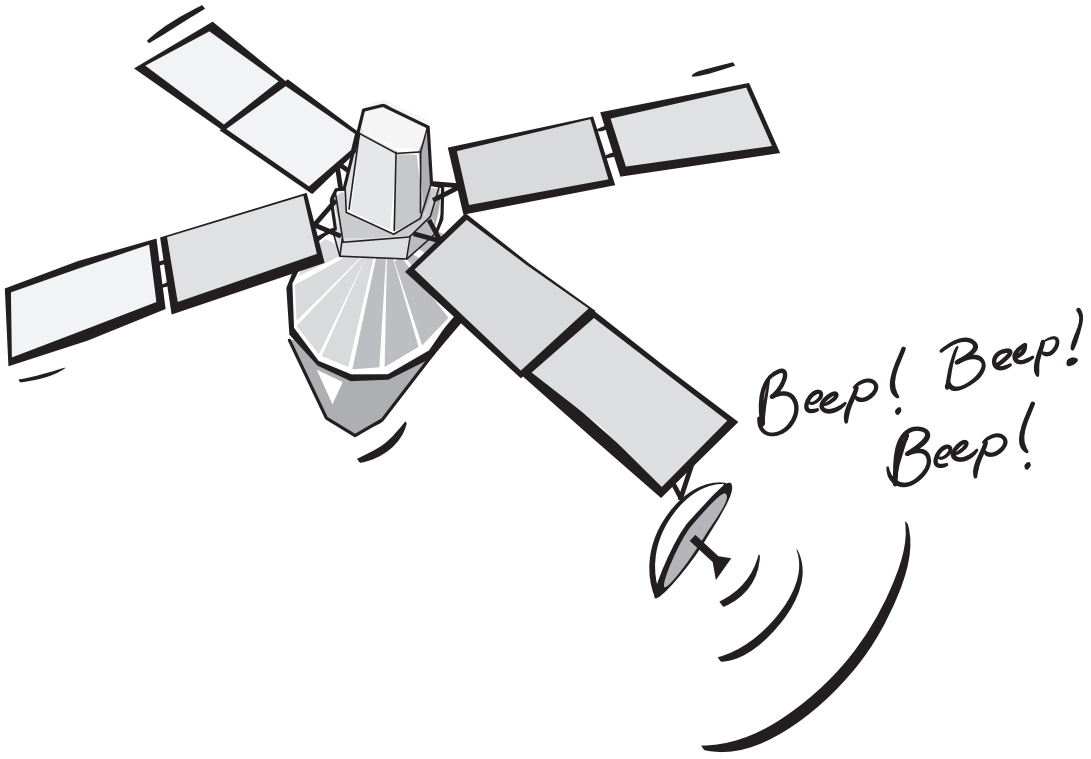
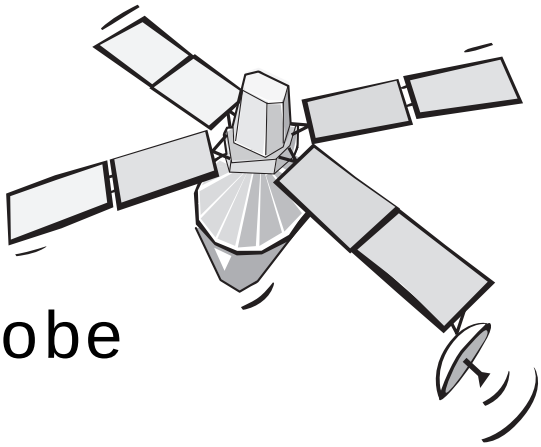


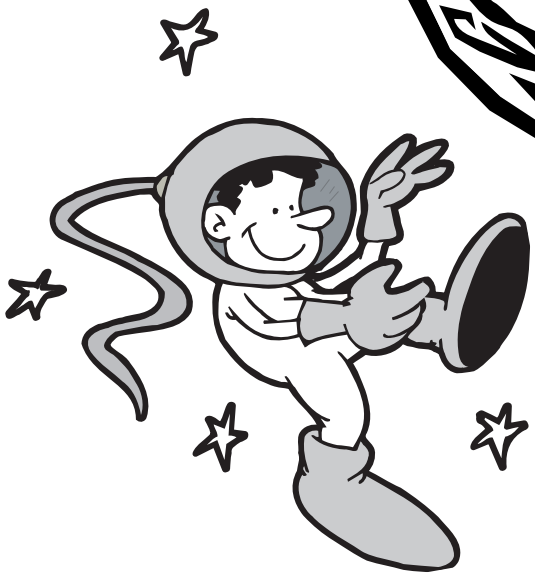
STUDENT COPY

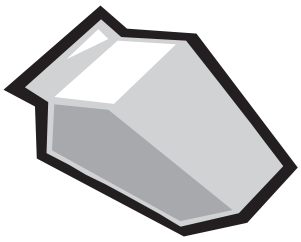
Designing a Planetary Probe



Here's a partial list of different elements that might be included aboard a space probe setting out to explore another planet. Please add to this list as needed.

1. Wide-angle zoom camera
   (To take precise images of a planet or its moons.)
2. Seismograph
   (To detect oscillations and earthquakes.)
3. Thermometer
4. Microscope
5. Biological experiment
   (To detect life forms.)
6. Radar
   (To examine the surface under the cloud layer.)
7. Soil analyzer
8. Lightning rod
9. Anemometer
   (To measure wind speed.)
10. Radio telescope
    (To detect radio emissions.)
11. Robot
12. Computer
13. Astronaut
14. Food
15. Air
16. Water





17. Toilet

18. Living quarters
(Where the crew will reside.)

19. Entertainment

20. Magnetic compass

21. Telescope

22. Solar panels
(To generate electrical energy.)

23. Nuclear reactor
(To generate electrical energy.)

24. Rocket fuel

25. Micro-rockets
(To control the vessel's direction.)

26. Compteur Geiger
(pour détecter les radiations)

27. Air conditioner

28. Heating system

29. Heat shield

30. Meteorite shield
(To protect the vessel against holes caused by small meteorites.)

31. Spacesuit

32. Radio transceiver
(To communicate with Earth.)

33. Landing module
(To land on a solid surface.)

34. Parachutes

35. Glider
(To travel through an atmosphere.)

36. Searchlights

37. Gas analyzer

38. Scientific experiment chosen by students

39. Other elements chosen by students