TRB 6:3 - Activity 3 - Probes to Other Planets

Summary

Students will construct a robot spacecraft model with common household items to explore a location in the Saturn System.

Materials

- Spacecraft Components Sheet
- Cassini Component Functions Table
- overhead of Cassini: A Robot in Our Own Image
- materials such as egg cartons, yogurt containers, film canisters, parts of children's toys, toilet paper tubes, etc.
- construction paper
- aluminum foil
- wire

Additional Resources

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Berger, Melvin and Gilda. *Can You Hear a Shout in Space?*. 2000.
Engaging information about space exploration. Question and answer format, drawings and photographs, text on facing pages, 48 pages.
Gustafson, John. *Voyager: An Adventure Through Space*. 1994
A description of the Voyager space mission. Photos, drawings, interspersed with short paragraphs, 32 pages. (Scholastic)
Johnstone, Michael. *The History News: In Space*. 1999
Chronicles history of astronomy from A.D. 145 through current space explorations. Written in a newspaper format, illustrated with drawing and photos, 6th grade reading level. $6.99 in paperback.
Scott, Elaine. *Close Encounters: Exploring the Universe with the Hubble Space Telescope*. 1998.

A look at how the Hubble has broadened our knowledge of space, both near images and distant images, including star birth and death. Large color photos and text covering about half the space, 64 pages. (Scholastic)
Gustafson, John. *Voyager: An Adventure Through Space*. 1994.
A description of the Voyager space mission. Photos, drawings, interspersed with short paragraphs, 32 pages. (Scholastic)
Skurzynski, Gloria. *Discover Mars*. 2000.
History of how man has learned about Mars, including Mariner, Viking I and II, and Path finder missions, and future plans. Large colored drawings and photos interspersed with short paragraphs, 48 pages. Comes with 3-D glasses for fun. (Scholastic)
Wunsch, Susi Trautmann. *The Adventures of Sojourner*. 1998.
Chronicles the Sojourner mission to Mars. About 2/3 text and 1/3 photos, 64 pages.

Background for Teachers

Technology is used in many ways to observe and explore the solar system and beyond. Some instruments allow us to perceive things that cannot be detected by human senses, such as portions of the electromagnetic spectrum (e.g., infrared, ultraviolet, etc.) invisible to human eyes.
Technology, in the form of spacecraft robots, permits us to vicariously explore in the remote and hostile environment that characterizes the solar system. Because of the vast distances within the

solar system, the time required to send instructions to or receive messages from these spacecraft ranges from a few minutes to several hours.
So, pre-programmed computers play a vital role in controlling the actions of these spacecraft. Computers also assist in performing the tedious calculations required to predict the motions of both these spacecraft and the planets that they are sent to explore. Just as computers are now a part of many things in everyday life, such as automobiles, washing machines, etc., computers also play small and large roles in scientists' efforts to understand the solar system. For example, computers are used to help point telescopes or other instruments correctly, and are used to process images or other data.
Cassini--Huygens is a robotic space mission sent to explore Saturn and its moons. It was launched in October 1997 and is scheduled to arrive at Saturn in July 2004. (Details of this mission can be found at: http://saturn.jpl.nasa.gov/cassini/index.shtml)
This spacecraft will serve as an example to help students understand how technology is used to explore the solar system.

Intended Learning Outcomes

- Use science process and thinking skills
- Manifest scientific attitudes and interests
- Understand science concepts and principles
- Communicate effectively using science language and reasoning
- Demonstrate awareness of social and historical aspects of science
- Understand the nature of science

Instructional Procedures

Invitation to Learn
:
Ask students to define a robot. Ask what robots might do in space and what capabilities they might have.
Instructional Procedures:

- Have students cut out parts of Cassini Robot from sheets of paper and assemble on another paper. (See Materials section.) They can glue them down when finished.
- Have students volunteer to explain why they put the parts of the robot in the locations they chose.
- Handout the Cassini Component Functions Table (See Materials section) and give students time to fill in the human anatomy column.
- Show students overhead made from Cassini: A Robot in our Own Image. (See Materials section.) Discuss student robot configurations and their answers to the Functions Table.
- Arrange students in groups and present the task: To construct a robot spacecraft to explore a location in the Saturn System.
- Student groups should first present the conditions they will encounter when they land. Will the spacecraft land on the surface of a moon or establish an orbit? Will it fly over or through rings? Will there be an atmosphere?
- Student groups should design and build models of their spacecraft from the assortment of objects you provide or they bring from home. The model robot should have all the components to fulfill critical functions. The components do not need to be functional.
- Students should present their robotic spacecraft models to the class. Each group member should explain a component.

Extensions

The activity can be downloaded from the activity page of Solar System Educators Program (SSEP) website at: http://www.ssep.org/orbits/activities.html
The activity is in pdf format. The free Acrobat Reader is needed to open the activity. The web page has a link to download Acrobat Reader if you do not have it. (Ignore the Student Worksheet on page 12-5).
Other activities on the Solar System Educators Program (SSEP) web site can serve as extensions.

"Which Way Should I Point?" is a short activity that reinforces some parts of the Cassini Robot and helps students understand problems in planning and carrying out observations.
"Returning Pictures From Space" and "Speaking in Phases" are activities that help students understand how spacecrafts communicate with Earth.

Assessment Plan

Student spacecrafts should include a framework, motors, antennas, computers, and a scientific instrument such as a camera or dust analyzer.
All students in the presentation are familiar with the functions of the parts on their spacecrafts.

Bibliography

This lesson is part of the Sixth Grade Science Teacher Resource Book (TRB3) http://www.usoe.org/curr/science/core/6th/TRB6/. The TRB3 is designed to be your textbook in teaching science curriculum to your students. This book covers all the objectives of each standard and benchmark. If taught efficiently, a student should do well on the End-of-Level (CRT) tests. The TRB3 is designed for teachers who know very little about science, as well as for teachers who have a broad understanding of science.

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