NASA/NSTA Symposium: Living and Working in Space: Energy
Saturday, November 4, 2006

8:00 AM – 8:25 AM
Welcome, Introductions, Goals for the Symposium

Al Byers, Assistant Executive Director of Government Partnerships and e-Learning, NSTA
Flavio Mendez, Symposia and Web Seminars Program Manager, NSTA

- About NSTA Symposia
- Agenda/Goals
- Forms/Logistics/Introductions

Dr. Terry Kucera, Senior Research Scientist, NASA Goddard Space Flight Center
Steven Johnson, International Space Station Flight Controller, NASA Johnson Space Center
Don Boonstra, Coordinator Student Observation Network, NASA Goddard Space Flight Center
Sheri Klug, Director of the Arizona State University Mars Education Program, Arizona State University

8:25 AM – 8:45 AM
Living and Working in Space

Don Boonstra, NASA Student Observation Network

Learning Outcomes:

After participating in the presentation,

- Participants will explain the goals for the workshop.
- Participants will locate resources on the SON module, Living and Working in Space: Energy, necessary to use Solar Energy for Space Exploration in their classrooms.

8:45 AM – 9:20 AM
Energy for Space Exploration

Steven Johnson, NASA JSC

Learning Outcomes:

After participating in the presentation,

- Participants will list the three types of spacecraft power systems.
- Participants will state advantages and disadvantages of spacecraft power system types.
- Participants will describe the ISS Electrical Power System.
- Participants will identify the type of power system theoretical spacecraft should employ.

9:20 AM – 10:15 AM
Activity 1: Solar Energy for Space Exploration, Part I

Don Boonstra, NASA and Sheri Klug, ASU

Learning Outcomes:

After participating in the activity,

- Participants will describe variables that affect the operation of solar panels.
- Participants will explain how these variables affect the power production of solar panels.
- Participants will be able to lead their students in the discovery of variables that affect the power production of solar panels.

10:15 AM – 10:30 AM
Break

10:30 AM – 11:05 AM
Sun: The Source

Dr. Terry Kucera, NASA GSFC

Learning Outcomes:

After participating in the presentation,

- Participants will describe how energy is produced in the Sun and how it moves outwards.
- Participants will describe the kinds of energy produced by the Sun.
- Participants will list different ways in which the Sun can affect space travelers.

11:05 AM – 12:05 PM
Activity 2: Solar Energy for Space Exploration, Part II

Sheri Klug, ASU and Don Boonstra, NASA

Learning Outcomes:

After participating in the activity,

- Participants will list similarities and differences of Mars in comparison to Earth and will relate these differences to their students.
- Participants will propose and defend a design to provide power to a Martian research habitat for six explorers using the ISS as a model.
- Using the resources and content provided in this symposium, participants will be able to integrate Solar Energy for Space Exploration into their classrooms.

12:05 PM – 12:30 PM
Final Words

- Post-assessment form
- Evaluation form/Survey/Credit info
- NSTA Web Seminars
- Raffle of door prizes

National Science Education Standards Addressed:
Content Standards, 5-8

Content Standard B:
Physical Science
As a result of their activities in grades 5-8, all students should develop an understanding of

- Transfer of Energy
  - Energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, sound, nuclei, and the nature of a chemical. Energy is transferred in many ways.
  - Electrical circuits provide a means of transferring electrical energy when heat, light, sound, and chemical changes are produced.
  - The sun is a major source of energy for changes on the earth's surface. The sun loses energy by emitting light. A tiny fraction of that light reaches the earth, transferring energy from the sun to the earth. The sun's energy arrives as light with a range of wavelengths, consisting of visible light, infrared, and ultraviolet radiation.

Content Standard D:
Earth and Space Science
As a result of their activities in grades 5-8, all students should develop an understanding of

- Earth in the Solar System
  - The earth is the third planet from the sun in a system that includes the moon, the sun, eight other planets and their moons, and smaller objects, such as asteroids and comets. The sun, an average star, is the central and largest body in the solar system.
  - The sun is the major source of energy for phenomena on the earth's surface, such as growth of plants, winds, ocean currents, and the water cycle. Seasons result from variations in the amount of the sun's energy hitting the surface, due to the tilt of the earth's rotation on its axis and the length of the day.

Content Standard E:
Science and Technology
As a result of their activities in grades 5-8, all students should develop the ability to

- Design a Solution or Product
  - Students should make and compare different proposals in the light of the criteria they have selected. They must consider constraints--such as cost, time, trade-offs, and materials needed--and communicate ideas with drawings and simple models.

Content Standard F:
Science in Personal and Social Perspectives
As a result of their activities in grades 5-8, all students should develop understanding of

- Natural Hazards
  - Internal and external processes of the earth system cause natural hazards, events that change or destroy human and wildlife habitats, damage property, and harm or kill humans. Natural hazards include earthquakes, landslides, wildfires, volcanic eruptions, floods, storms, and even possible impacts of asteroids.

Content Standard G:
History and Nature of Science
As a result of their activities in grades 5-8, all students should develop understanding of

- Science as a Human Endeavor
  - Women and men of various social and ethnic backgrounds--and with diverse interests, talents, qualities, and motivations--engage in the activities of science, engineering, and related fields such as the health professions. Some scientists work in teams, and some work alone, but all communicate extensively with others.

Standards for School Mathematics Addressed:

Students should estimate, make and use measurements to describe and compare phenomena; select appropriate units and tools to measure to the degree of accuracy required in a particular situation; develop formulas and procedures for determining measures to solve problems.