NASA/NSTA Symposium: Lunar Exploration
Friday, October 20, 2006

8:30 AM – 9:00 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/Credit Info/Logistics/Introductions

Dr. Anuradha Koratkar, Associate Research Scientist, University of Maryland Baltimore County's Goddard Earth Science and Technology Center
Dr. Susan Hoban, Senior Research Scientist, University of Maryland Baltimore County's Goddard Earth Science and Technology Center
Laurie Cook, Student Assistant, University of Maryland Baltimore County
Brendan Shaughnessy, Student Assistant, New Mexico State University
Albert Hill, Student Assistant, Wesleyan University

9:00 AM – 9:15 AM
Impact Crater

Dr. Anuradha Koratkar, Dr. Susan Hoban, Brendan Shaughnessy, and Albert Hill

Learning Outcomes:

After participating in the activity, participants will be able to:
- Make a crater to see the components of an impact crater and discuss factors affecting the appearance of impact craters and ejecta.

9:15 AM – 11:00 AM
Location, Location, Location

Dr. Anuradha Koratkar, Dr. Susan Hoban, Brendan Shaughnessy, and Albert Hill

Learning Outcomes:

After participating in the presentation/activity, participants will be able to:
- Use measurement as a tool to answer questions.
- Convert from one measurement system to another.
- Explain measurable attributes of objects and the units, systems, and processes of measurement, measurement uncertainty and data presentation.
- Determine the size of craters on the moon.
- Present data in tabular and graphical form.

11:00 AM – 11:15 AM
Break

11:15 AM – 11:45 AM
Why Do We Explore? Why the Moon?

Dr. Anuradha Koratkar

Learning Outcomes:

After participating in the discussion, participants will be able to:
- Make a list of social, political, and scientific factors that influence space exploration.

11:45 AM – 12:15 PM

History of Lunar Exploration and Lunar Facts

Brendan Shaughnessy and Albert Hill

Learning Outcomes:

After participating in the presentation, participants will be able to:

- Describe in writing a basic understanding of the Earth-Moon system.
- List the various strategies used to explore the Moon.

12:15 PM – 1:00 PM

Lunch

1:00 PM – 4:30 PM

Principles of Remote Exploration (PREP)

Dr. Anuradha Koratkar, Dr. Susan Hoban, Laurie Cook, Brendan Shaughnessy, and Albert Hill

Learning Outcomes:

After participating in the presentation/activity, participants will be able to:

- Explain the logical processes involved in robot control.
- Explain the myriad requirements of a robotic mission, including remote sensing, communications, control logic, and mission planning.
- Create a map and use it for analytical planning.
- Explain measurement uncertainty and convert from one measurement unit to another.
- Describe how the "PREP" activity is planned.
- Explain the importance of teamwork and apply cooperative learning skills.

4:30 PM – 5:00 PM

Final Words

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

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

Content Standard A:
As a result of activities in grades 5-8, all students should develop

- Abilities Necessary to do Scientific Inquiry
  - USE TECHNOLOGY AND MATHEMATICS TO IMPROVE INVESTIGATIONS AND COMMUNICATIONS. A variety of technologies, such as hand tools, measuring instruments, and calculators, should be an integral component of scientific investigations. The use of computers for the collection, analysis, and display of data is also a part of this standard. Mathematics plays an essential role in all aspects of an inquiry. For example, measurement is used for posing questions, formulas are used for developing explanations, and charts and graphs are used for communicating results.

- Understandings about Scientific Inquiry
  - Mathematics is important in all aspects of scientific inquiry.
  - Technology used to gather data enhances accuracy and allows scientists to analyze and quantify results of investigations.
  - Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories. The scientific community accepts and uses such explanations until displaced by better scientific ones. When such displacement occurs, science advances.

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
  - Most objects in the solar system are in regular and predictable motion. Those motions explain such phenomena as the day, the year, phases of the moon, and eclipses.

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

- Understanding about Science and Technology
  - Perfectly designed solutions do not exist. All technological solutions have trade-offs, such as safety, cost, efficiency, and appearance. Engineers often build in back-up systems to provide safety. Risk is part of living in a highly technological world. Reducing risk often results in new technology.

  - Technological designs have constraints. Some constraints are unavoidable, for example, properties of materials, or effects of weather and friction; other constraints limit choices in the design, for example, environmental protection, human safety, and aesthetics.

NCTM Standards Addressed:

Algebra Standard for Grades 6-8

- **Represent and analyze mathematical situations and structures using algebraic symbols.**
  - Explore relationships between symbolic expressions and graphs of lines, paying particular attention to the meaning of intercept and slope.

- **Use mathematical models to represent and understand quantitative relationships.**
  - Model and solve contextualized problems using various representations, such as graphs, tables and equations.

- **Analyze change in various contexts.**
  - Use graphs to analyze the nature of changes in quantities in linear relationships.

Measurement Standard for Grades 6-8

- **Understand measurable attributes of objects and the units, systems, and processes of measurement.**
  - Understand both metric and customary systems of measurement;
  - Understand, select, and use units of appropriate size and type to measure angles, perimeter, surface area, and volume.

- **Apply appropriate techniques, tools and formulas to determine measurements.**
  - Use common benchmarks to select appropriate methods for estimating measurements;
  - Select and apply techniques and tools to accurately find length, area, volume, and angle measures to appropriate levels of precision;
  - Solve problems involving scale factors, using ratio and proportion.

Data Analysis and Probability Standard for Grades 6-8

- **Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.**
  - Formulate questions, design studies, and collect data about a characteristic shared by two populations or different characteristics within one population;
  - Select, create, and use appropriate graphical representations of data, including histograms, box plots, and scatter plots**.**

ITEA Technological Literacy Standards Addressed:

The Nature of Technology

- **Standard 2: Students will develop an understanding of the core concepts of technology, grades 6-8**
    - Technological systems include input, process, output and, at times, feedback.

- **Standard 3: Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study, grades 6-8**
    - A product, system or environment developed for one setting may be applied to another setting.

Design

- **Standard 8: Students will develop an understanding of the attributes of design, grades 6-8**
    - Design is a creative planning process that leads to useful products and systems.
    - There is no perfect design.
    - Requirements for a design are made up of criteria and constraints.

- **Standard 9: Students will develop an understanding of engineering design, grades 6-8**
    - Design involves a set of steps, which can be performed in different sequences and repeated as needed.
    - Brainstorming is a group problem-solving design process in which each person in the group presents his or her ideas in an open forum.
    - Modeling, testing, evaluating and modifying are used to transform ideas into practical solutions.