Human Exploration: People, Education, & Technology

International Technology Educators Association

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PROGRAM DESCRIPTION

The purpose of this project is to develop educational design challenges and enhance technological literacy through the formal education process in grades K-12.

- Engineering Design Challenges: Lunar Plant Growth Chamber (EDCLPGC) project: The design challenges, in conjunction with the launch of STS-118, are grade level appropriate for elementary, middle, and high school. The objective is to design and build a self-contained plant growth chamber for use in habitats in space. The prototypes are designed with attention to the suitability of use on the International Space Station with transferability to habitats on the moon and potentially Mars. Further, the design challenges were developed around the overall context of establishing a living community on the moon that includes a sustainable human presence. The content and objectives of the challenges are standards based.
- The Human Exploration Project (HEP) includes curricular units for elementary, middle, and high school students that are complete with guidelines for teacher preparation, materials lists, guidelines for classroom safety and conduct, comprehensive student and teacher resources, suggested additional student and teacher resources, required student knowledge and skills, and assessments. HEP I: Energy & Power: Living and Working on the Lunar Surface will include one unit in each of the grade bands: elementary, middle, and high school. HEP II: Transportation: Living and Working in Space will include 2 middle school units and 2 high school units. (These units are currently going through the NASA education product review process.)

PROGRAM RELEVANCE TO NASA

Understanding is crucial to public support of the space exploration mission. NASA is planning to launch new, advanced technologies in pursuit of space exploration. These technologies cover a wide spectrum of concerns, including: power, communications, transportation, computing, nanotechnology, biotechnology, robotics, and materials development. Also, future NASA robotic and human missions to the moon, Mars, and Jupiter's icy moons foretell of scientific discoveries heretofore unimaginable. And therein lies the potential for future technologies that will enhance both space exploration as well as life on Earth. The Designing Human Exploration curriculum project is a logical and necessary step forward in continuing and increasing implementation of formal technology education for all students which will contribute significantly to a broad public understanding of science, mathematics, and technology.

PROGRAM BENEFITS TO SOCIETY

Technological processes have become so complex that the community and schools collaborate to provide a quality technology program that prepares students for a

changing world that is progressively more dependent on an informed, technologically literate citizenry. Based upon the acknowledged need for technological literacy, it is reasonable to expect the number of teachers delivering technological literacy to increase. The Designing Human Exploration curriculum project will aid the implementation process into classrooms.

PROGRAM GOALS

- Develop 3 units (elementary, middle and high school) with two tracks: design or design and build for the Lunar Plant Growth Chamber project.
- Develop 3 units (elementary, middle, and high school) for the Human Exploration Project I centered on Energy and Power.
- Develop 4 units (2 middle school and 2 high school) for the Human Exploration Project II centered on Transportation.
- Provide a standards-based K-12 program that ensures that all students are technologically literate.
- Provide opportunities for all students without regard to gender or ethnic origin.
- Provide clear standards and expectations for increasing student achievement in math, science, and technology.
- Provide leadership and support that will produce continuous improvement and innovation in the program.
- Restore America's status as the leader in innovation.
- Provide a program that constructs learning from a very early age and culminates in a capstone experience that leads students to become the next generation of technologists, innovators, designers, and engineers.

PROGRAM ACCOMPLISHMENTS

HEP I & II

- Within the first two quarters of 2008, all NASA Subject Matter Expert reviews have been completed and the 7 units of HEP I and HEP II have been received by NASA educational content review. To date, one unit has received final approval.

STS-118 Engineering Design Challenge: Lunar Plant Growth Chamber

- All three units were posted on the NASA portal prior to the STS-118 launch.
- To date, 8,780 teachers have registered to participate in the EDCLPGC project impacting 864,241 students across the U.S.
- Numerous teacher and student workshops have been presented at various schools, national conferences, museums and science centers, Sally Ride workshops, Space Camp workshops and more.
- Teachers providing feedback rank the challenge in the following areas, 5 being the highest:

The challenge engages students in active learning.	4.8
The challenge appeals to a wide range of student abilities and interests	4.8
The teaching materials and resources are helpful, comprehensive, organized and easy to use.	4.4
The background materials provided are sufficient.	4.4
The challenge was a valuable experience.	4.8
NASA related materials provided can be included in your curriculum.	4.7
I expect to use the materials again in the future.	4.6
How would you rate the effectiveness of the program in teaching the intended standards?	4.6

STUDENT ACCOMPLISHMENTS

- Teachers participating in the EDCLPGC project ranked the level of student interest before and after the project. (5 the highest ranking)

Content Area	Before	After	% Increase
Science	3.6	4.6	20 %
Math	3.1	3.7	12 %
Engineering	2.6	3.9	26 %
Technology	3.4	4.2	16 %