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Paper Session I-D - Marsville - Elementary Students Design a Colony of the Future

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ABSTRACT

The Air Force Phillips Laboratory sponsors a yearly event called Marsville, in which 350 fifth grade students design and build a life-size model of a Martian colony and the life support systems to support it. The program aims to 1) expose students to technological, scientific and environmental issues related to space exploration, 2) demonstrate problem solving and team learning using a cooperative model, and 3) provide students with positive role models from the fields of science and technology. The Marsville concept was conceived by the Challenger Center and is one of many educational outreach programs offered by Phillips Laboratory.

INTRODUCTION

A goal of Phillips Laboratory’s Office of Technology Transfer for Education is to reach all levels of students in grades K-12. The office’s initial programs were targeted for high school and middle school students only. Since Phillips Laboratory is a national leader in space research and development, it was desirable to find an elementary school outreach program based on a space theme. Laboratory scientists could share their expertise with students and challenge them to solve space related problems. The Marsville Program, developed by Challenger Center, was selected to fill this gap.

BACKGROUND

Marsville is a classroom based simulation in which students work in teams to plan and design a Martian settlement. The Challenger Center for Space Science Education developed Marsville as a way to turn American children on to math and science. Challenger Center is the educational organization founded by the families of the Challenger astronauts to continue the crew’s educational mission. Using space exploration as a theme, Challenger Center creates positive experiences that excite students about the impact of technology on their future, and that inspire them to pursue math, science, and technology studies.
Phillips Laboratory began offering Marsville to Albuquerque fifth-graders during the 1994-1995 school year. Twelve schools participated that first year. For the 1995-1996 school year, Phillips Laboratory expanded the program to include Clovis, New Mexico as well as Albuquerque for a total of thirteen schools. This year, 16 schools, 48 teachers and parents, and approximately 350 students participated.

GOALS

• The program has several goals:
• To expose students to technological, scientific, and environmental issues related to space exploration.
• To demonstrate problem solving and team learning using a cooperative model.
• To provide students with positive role models from the fields of science and technology.

TEACHER WORKSHOP AND SUPPORT

The program begins with an all-day teacher-training workshop held at Phillips Laboratory during the month of November. During this training, teachers are given information they need for the project. During the workshop, teachers build a scale model Martian habitat and the life support systems used within. Throughout the five month project, the teachers receive a biweekly newsletter to keep them abreast of upcoming events and deadlines.

MARS RESEARCH

Classes begin their mission by researching the planet Mars. They study the basic properties of the planet including its size, soil, atmosphere, axis tilt, gravity and surface features. Scientists from Phillips Laboratory and other organizations visit the schools to speak to the fifth-graders. The students soon learn the Internet is a rich source of information. Teachers show videos to explore the past and present NASA missions to Mars and books are read and periodicals searched for articles about the red planet.

LIFE SUPPORT SYSTEMS

Every participating school has three teams consisting of five to seven students each. Individual teams are assigned responsibility for one facet of a Martian colony and must design a life support system to sustain it. These systems consist of temperature control, water quality, air supply, communications, food production, transportation, and waste management. Schools are given a list of Phillips Laboratory scientists who can advise them in planning and building their life support system models. Each model is labeled with four facts about Mars to show how the team’s research is incorporated into the system. A riddle about the system is written on a poster for observers to ponder and a presenter is chosen to describe of the life support system at Link-Up Day.
FAXAPHON

Each Marsville team is grouped with two other teams in different schools to form a habitat crew. The crew is responsible for cooperatively designing the life-size plastic habitat that will house the Martian colony. Over a period of several months, teams communicate their construction plans to each other through written or electronic means without seeing each other face-to-face. Each team is responsible for certain parts of the habitat, which they pre-cut and take to Link-Up-Day. These parts consist of walls, ceiling, floor, door, air lock, fan tunnel, and connecting tunnel. Uniforms for Link-Up Day are also coordinated.

LINK-UP DAY

Teams and invited guests from the schools, the legislature, Phillips Laboratory, and the community convene at a Phillips Laboratory hangar in March. The student teams meet their fellow habitat crew members in person for the first time. Together they construct and decorate their inflatable plastic habitats, each measuring 12 feet by 12 feet by 8 feet. The entire colony consists of sixteen habitats.

LUNCH ON MARS

Lunch is the first activity to take place in the Martian colony. Each team member is responsible for his/her lunch fulfilling specified requirements. It must be nutritionally complete, cannot weigh more than 20 ounces, have at least ten ounces of fluids, and cannot have more than two ounces of waste at the completion of the meal. Scales at the lunch weigh-in table ensure that these requirements have been met.

CELESTIAL QUESTIAL

After lunch, the previously constructed life support systems are erected in the habitats and the Celestial Questial begins. The presenter from each team takes three minutes to explain the team’s life-support system. This event reveals the vast knowledge the students have acquired about their systems. Even the adults are in awe at the scientific details presented by the fifth-graders. Student teams travel to different habitats to hear a total of nine presentations and to try to answer the riddle posed by each presenter.

MARSVILLE WALK-THROUGH

After the presentations, connecting tunnels are built linking all of the habitats together. Team are led by their teachers in a walk-through of the entire colony. Parents, friends, Phillips Laboratory personnel, and other guests are then invited to examine the life support systems and habitat decorations as they walk through the village.
CONCLUDING CEREMONIES

The local media is usually very interested in the event and time is provided for student interviews. The teams then all assemble in front of their habitats while the Commander of Phillips Laboratory congratulates the group and hands out certificates of completion.

WHAT IF?

Back in the classroom, a “What If” activity provides closure for the Marsville program. During this responsible decision-making activity, students are presented with a Mars colony problem scenario. Students brainstorm solutions to the problem under time limitations and must come to a consensus that provides the greatest benefit and least harm to the people affected.

CLOSING COMMENTS

Marsville events have taken place throughout the United States for several years. The program continues to be met with enthusiasm and has received several educational awards. The overall results of program evaluations by teachers and students are very positive. Most encouraging are the responses that 98% of the teachers would repeat Marsville and that 96% of the students would recommend it to others. The most favorable responses from the teachers were in Marsville meeting learning objectives for processes and science content, and for the activities being educationally worthwhile and appropriate for the age group.