



The Space Congress® Proceedings

1990 (27th) 90's - Decade Of Opportunity

Apr 26th, 1:00 PM - 4:00 PM

Paper Session III-B - Journeys of the Hind: Space Education

Patricia Manning

Professor, College of Education, University of Central Florida

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Journeys of the Mind:
Space Education
by
Dr. Patricia Manning, Dr. James M. Ragusa
and Ms. Leslie Nelhouse

ABSTRACT

Young people, given the important facts of space exploration can make exciting "journeys of the mind" into events which will shape their future. In order to whet the appetite and create visions they should be prepared for real space journeys of the future. To accomplish this task, kindergarten through college curriculum must include all facets of space education.

Teachers now and in the future must be able to stimulate the minds of their students for space education. To do this, space related teacher training programs need to be developed, expanded, and implemented. Currently, there are several on-going and successful teacher training programs. They include: NASA/National Science Teachers Association (NSTA) Educational Workshops for elementary and secondary math and science teachers; Space Academy for Educators in Huntsville, Alabama; and Teacher Symposiums sponsored by the National Space Club, Florida Committee.

Several local space education programs that are in the planning stages include: Teaching the Future: Professional Educators Countdown to Learning, in Titusville, Florida; the Space Education and Research Center (SERC) at the University of Central Florida; and the Space Education Development Program (SEDP) of the Florida Space Grant Consortium.

INTRODUCTION

The purpose of this paper is to identify and briefly describe several national and local space education programs which exist or are planned. These programs, hopefully, will encourage teachers trained in space curriculum to stimulate "journeys of the mind" for students who will become our next generation of space explorers.

Young people, given the important facts of space exploration can make exciting "journeys of the mind" into events which will shape their future. To whet the appetites of students so that they will make these journeys in the twenty-first century, an expanded and formalized space education thrust is needed.

Teachers now and in the future must be able to devote time and energy to developing programs for students, colleagues, and the community. To do this, space education teacher training programs need to be developed and expanded. Currently, there are in operation or are in planning several national and local exemplary space education programs for teachers.

* Professor, College of Education, University of Central Florida; Associate Professor, College of Business, University of Central Florida; and Director, U.S. Space Camp, Titusville, Florida, respectively.

The current programs are as follows:

1. NASA Education Workshops for Elementary Teachers (NEWEST). A joint program between NASA and the National Science Teachers Association.
2. NASA Education Workshops for Secondary Math and Science Teachers (NEWMAST). A joint program with NASA and National Science Teachers Association.
3. Space Academy for Educators in Huntsville, Alabama. A joint program with U.S. Space Camp Foundation, The Space and Rocket Center; NASA - Marshall Space Flight Center; and the University of Alabama (Huntsville).
4. Teacher Symposiums in Space Education, National Space Club, Florida Committee.

Programs that are in the planning stages:

1. Teaching the Future: Professional Educators Countdown to Learning, Titusville, Florida. A joint Program with U.S. Space Camp Foundation, NASA-Kennedy Space Center, Florida; and the University of Central Florida, (Orlando and Cocoa campuses).
2. Space Education and Research Center (SERC), University of Central Florida, Orlando, Florida.
3. Space Education Development Program (SEDP), Florida Space Grant Consortium.

CURRENT PROGRAMS

NASA Education Workshops (NEWEST and NEWMAST)

NASA has committed its human technical resources to developing educational workshops for elementary and secondary math and science teachers. The workshops are held for two weeks in the summer at NASA centers around the country. These workshops have proven to be outstanding programs for teachers with objectives which allow educators to:

- a. observe and participate in current and state-of-the-art research and development activities in space science technology at all NASA centers.
- b. interact directly with NASA scientists and engineers in their research laboratories and development centers.
- c. learn about test project results directly from the NASA scientists and engineers conducting the studies.
- d. learn new techniques utilized by scientists solving problems in aerospace.
- e. examine and review current NASA resource materials available for schools.

- f. provide assistance in preparing aerospace resources for curriculum development.
- g. provide an update on existing and new career opportunities for students in space science and technology.
- h. prepare participating educators as resource envoys for space education.

In exchange for NASA's contribution of resources to this program, these outstanding teachers will share their knowledge of the space programs with students and other teachers. A major result of these workshops is teacher acquired knowledge about space program technology and the benefits for mankind. An end result is that they develop an increased awareness of "our world instead of my world."

Among eagles, ospreys, alligators, and rockets, teacher workshops are held at both the Kennedy Space Center and at the adjacent National Wildlife Refuge. There they discover that a complex futuristic Space Transportation System (STS) can operate successfully with nature. Teachers follow in the giant steps of astronauts, who continue to explore our solar system. These awe inspiring learning experiences serve as a catalyst for teachers who eventually will launch young minds into space-related careers, space travel, and space colonization.

The efficiency and teamwork required to support the space center objectives serves as an inspiration to teachers and students. Another important aspect of these workshops is that teachers experience the teamwork that is evidenced everywhere at NASA's Kennedy Space Center. The quality of work and the teamwork necessary to support the challenging objectives of the Kennedy Space Center serve as an inspiration to teachers and students. Knowing that 18,000 aerospace workers cooperate to attain a common goal provides a lesson worth sharing with teachers and students.

At all facilities, teachers are briefed and instructed by top-level managers, scientists, and engineers, so the experience can be as meaningful and complete as possible. To their credit, the NASA people treat the teachers with respect and challenge them to become creative and inspiring. Teachers return to their schools with the parting words of Kennedy Space Center's Director General Forrest McCartney, "When you leave here, I want you to be pleased, impressed, and proud to be an American."

Space Academy for Educators

The Space Academy for Educators, located in Huntsville, Alabama, is sponsored by the U.S. Space Camp Foundation, The Space and Rocket Center, NASA's Marshall Space Flight Center, and the University of Alabama. Teachers interact with astronauts and rocket scientists through lectures, seminars, computer applications, and hands-on experiences with space simulation equipment. At their fingertips are resources and materials to facilitate improved space education in their classrooms. The Space Academy for Educators is a five day intensive program. Those educators who complete all activities earn three hours of graduate credit from the University of Alabama.

The Teacher Symposium on Space Education

The Teacher Symposium on Space Education is an initiative of the Florida Committee's National Space Club. In 1989 there were two symposiums for teachers held at the NASA-Kennedy Space Center and the U.S. Space Camp in Titusville, Florida. Educators were given briefings on space technology by NASA scientists and engineers, and learned how to develop a Young Astronauts Chapter in their schools. Symposium participants were also given briefings on teaching materials available at the NASA Educator's Resource Center. As a bonus, they simulated weightlessness and developed hands-on skills at the U.S. Space Camp in Titusville.

FUTURE PROGRAMS

Mentioned earlier are three Florida programs currently in the planning stage. They are: Teaching the Future: Professional Educators Countdown to Learning, the Space Education and Research Center (SERC), and the Space Education Development Program (SEDP).

Teaching the Future: Professional Educators Countdown to Learning

The U.S. Space Camp in Titusville, Florida, the University of Central Florida's College of Education, and NASA at the Kennedy Space Center have combined to bring this, new and unexplored perspective to classroom teachers. Working together, these partners endeavor to stimulate intellectual curiosity among students. Scheduled to begin in April, 1990, Countdown to Learning is an intensive and challenging five day program. It is designed to prepare educators to stay at the forefront of today's ever changing technology. As educators begin to understand the increasingly sophisticated developments in space technology, they will be better able to communicate these complexities and possibilities to their students. The combination of innovative techniques and hands-on experience covers a wide variety of subjects in a comprehensive manner.

Aspects of the program fall into two parts: classroom lectures and space simulation activities. The lectures are designed to introduce the space sciences and emphasize the past, present, and future roles of the Kennedy Space Center in space exploration. The space simulation activities will enhance and complement the lectures by demonstrating what working and living in a space environment might really be like. Some of the topics to be covered include: the history of NASA, the impact of space technology and spinoffs, the Galileo and Hubble Space Telescope missions, and Space Stations. Science subjects include: our environment, astronomy, rocket propulsion, orbits, trajectories, space physiology, optics, lasers, and holography. Other activities include Space Shuttle mission simulation, neutral buoyancy training, the NASA Educator's Resource Laboratory, and lesson planning.

The end result of exposure to these diverse but essential topics is an improved understanding of space history, the impact and current development of the space related sciences, NASA programs, scientific principles, and teacher resources and methods. As teachers learn more about these subject they quickly realize that research originally conducted to solve the problems of traveling and working in space has often contributed to solutions for major problems on earth. As they learn about the effects that space travel and exploration have had on all our

lives, the teachers become more motivated and better equipped to communicate this knowledge to their students. Students, who with this knowledge, will become the astronauts, scientists, leaders, and citizens on our last frontier -- space. Educators completing all activities and assignments will earn three hours of graduate credit from the University of Central Florida.

The Space Education and Research Center (SERC)

In the Fall of 1989, at the direction of its President, the University of Central Florida undertook a major study of its capabilities and faculty interests relating to space. This led to the development of a Space Education and Research Center (SERC). SERC was accepted by the UCF Council of Deans, the Provost and the President in December, 1989.

Several specific projects have been identified and will be completed as part of the SERC concept. Targeted is the development of a space-related research, education, and service infrastructure. Planned activities after staffing, physical facility identification, and start up include:

1. conduct of comprehensive needs assessment and capabilities to serve as a foundation for future activities.
2. assembling of multidisciplinary research teams (one internal to UCF and one involving other state universities) to develop two major research proposals.
3. demonstration of an exploitable link between ongoing space-related research and K-12 education.
4. development and a demonstration of a novel, animated, computer-generated tour through space research in Florida.
5. specification of library resources needed for space research, education, and service in Florida.
6. a model program for integrating space research into academic minors in undergraduate and graduate level degree programs.

Most important to this paper is the planned SERC research link to K-12 education. A part of the SERC mission will be to bring the excitement of space research to both students and teachers in Florida's elementary and secondary schools. Toward that goal, one of the planned research projects identified above will be earmarked as a vehicle for demonstrating the benefits of linking ongoing university research with educational programs for K-12 teachers and students.

As a part of the SERC concept, two high school teachers will be involved in university space-related research activities in the Summer 1990 and 1991 semesters. During their normal academic year, it is planned that they will continue to interact with university researchers as they utilize project ideas and outcomes in their own classrooms.

In the SERC plan, the goal is to create an alternate reality system, in which students can study the impact of space research and government policy. In this, simulations and role-playing will be developed to allow students to make policy decision about the space program. The student might, for instance, reject manned space flight

in favor of less expensive, unmanned flight, and then experience the technical, economic, and political ramifications.

To accomplish this task, a multidisciplinary project team, involving K-12 classroom teachers, is required. This team will work in pre-service teacher preparation, as selected parts of actual space research projects will be set up in the Science Education Laboratory of the UCF College of Education.

The proposed timetable for this project includes demonstration of a prototype simulation by the end of the Summer 1990, classroom testing in the Fall 1990 and Spring 1991 semester, and a product scheduled to be ready for public distribution by the Summer of 1991.

At the graduate and undergraduate level, a minor in Space studies is to be offered by the University of Central Florida. This program of studies would be designed to prepare students for positions in the commercial, governmental and educational sectors of space exploration, development and settlement. Students in the minor would supplement coursework in their chosen field with multidisciplinary specialization courses. Requiring coursework in policy as well as technical areas, students would be better prepared to understand and deal with complex and multidisciplinary problems inherent in developing hardware and mechanisms for people to travel, live, and work in space. The SERC would coordinate the Minor programs, perhaps utilizing the university honors program as a model.

The Minor in Space Studies would require at least 12 graduate hours and 15 at the undergraduate level. These hours would be taken in conjunction with the coursework required within a student's stated field of study. Both programs, of course, would be subject to approval by the appropriate undergraduate and graduate committees.

The Space Education Development Program (SEDP)

A consortium of four Florida universities (Florida State University, the University of Florida, Florida A&M, and the University of Miami) was recently awarded Space Grant College status by NASA. This consortium, which is able to expand its membership, currently operates in concert with eight other affiliated universities, including the University of Central Florida. A major thrust of the Florida Space Grant Consortium is the Space Education Development Program (SEDP). The long-term objective of the SEDP is to foster innovative effort to enhance existing and develop new courses, curricula, and systems of delivery for an ensemble of aerospace-related math, science, and engineering educational programs at all levels. Initially, the SEDP will focus on enhancements affecting grades K-12.

Established and experimental courses built around space-related knowledge have attracted a high level of student interest and at all age levels (e.g. the Young Astronaut Program, the Challenger Foundation, U. S. Space Camp, and NASA educational programs). The SEDP in Florida, as well as the other organizations mentioned, are offering opportunities for involvement. All make one thing immediately clear -- universities, organizations, and research groups that wish to be involved must be prepared to operate on a multidisciplinary basis. The problems to be addressed are not one-dimensional, and must be responded to accordingly. To be really effective in K-12 education and teacher-training, programs will at some point mean investment in a classroom-of-the-future. The level of activity in this field clearly justifies that investment.

CONCLUSION

The importance of space education is reflected in the following comment from Ms. Daren Sievers, a middle school teacher from Des Moines, Iowa and a NEWEST participant in 1988, who said:

"What about an astronaut walking on Mars or mining the moon? Dreams perhaps, but children create dreams, and adults use technology with their dreams. Educators have an obligation to encourage imagination. The study of space has built-in enthusiasm unlike any area of the curriculum. This subject can be as interesting as any dinosaur that once walked our earth. Space education crosses all curricular areas and is naturally integrated. If teachers grasp the moment, the space/scientific literacy of students will have a gigantic ripple effect beyond classrooms, to peers, to communities, and yes, to the stars."

The programs that have been implemented and those in the planning stages are exemplified by the following Chinese proverb:

"I hear and I forgot;
I see and I remember;
I do and I understand."

Teachers trained in space curriculum, have the potential of stimulating "journeys of the mind" for students who will become our space explorers of the future.