Workshop 10

Focusing Educational Initiatives

George K. Parks, Program Director
Lisa Peterson
University of Washington Space Grant College
University of Washington
Seattle, Washington 98195

First National Space Grant Conference
Columbia, Maryland
January 16-19, 1990

Focusing Educational Initiatives

Abstract

The United States will soon be facing a critical shortage of aerospace scientists and engineers. To address this problem, Space Grant Colleges can assist in focusing interest in existing educational initiatives and in creating new educational opportunities, particularly for women and underrepresented minorities.

Introduction

The availability of qualified scientists and engineers needed to maintain US leadership in aerospace science and engineering is approaching crisis proportions. By the year 2000, America will face a shortage of scientists and engineers. As the proportion of minorities to whites increases, and as more white males turn to non-engineering/science fields, there will be a critical shortage of trained professionals. Women and minorities must be given the educational opportunities necessary for them to qualify for positions as scientists and engineers. To address this crisis, NASA has created the Space Grant Colleges and Consortia to establish a national network of universities with interests and capabilities in aeronautics, space, and related fields. The purpose of the Space Grant Colleges and Consortia is to encourage cooperative programs among universities, the aerospace industry, and federal, state, and local governments. In addition, they are to encourage interdisciplinary training, research, and public-service programs related to aerospace; recruit and train professionals, especially women and underrepresented minorities, for careers in aerospace science, technology, and allied fields; and promote a strong science, mathematics, and technology education base from elementary through university levels.

The task of this workshop is to provide a format by which Space Grant programs can identify, disseminate information about, leverage, and help to focus existing and developing educational initiatives of aerospace interest.

Collection and Dissemination of Information

Space Grant Colleges can increase the general public awareness of aerospace science and engineering issues. This can be done through posters and brochures, newspapers, and television advertising centrally designed and targeted at these specific populations. It can also be done through more specific channels. Individual programs can send information to prospective undergraduate and graduate students, secondary level science teachers, and to local professional and amateur science and engineering associations.

Space Grant Colleges and Consortia should gather information on educational opportunities in aerospace science and engineering in their state or region. Information can be collected from federal educational organizations, from other Space Grant institutions, from NASA research centers (Ames Research Center, Johnson Space Center, Jet Propulsion Lab, etc.), from local educational groups, and from groups providing financial support for education. A library of the collected information should be established so that Space Grant institutions can serve as clearinghouses for aerospace science and engineering opportunities. Students and educators should have access to all of this information, both for checking out, and for photocopying. The Space Grant programs should be responsible for keeping this information current. The Space Grant programs can increase their own visibility through this library, and can provide a central location of aerospace education information that will serve a wide region.

To increase awareness of and interest in aerospace science and engineering topics, the information collected must be disseminated to educators, students, and the public. This can be done through a variety of means. A newsletter, either centrally edited or produced at one of the Consortia members, can be sent to all interested parties. This newsletter should contain up-to-date information on aerospace science and engineering research and educational opportunities for researches, teachers, and students. Educational advancement opportunities can be advertised through local and state teachers' organizations, and can be sent directly to established mailing lists of teachers interested in aerospace science and engineering.

A "speaker's bureau" can be established, consisting of persons in education and in industry who are willing to speak to the general public and to K-12 schools on aerospace science and engineering topics. The Space Grant Graduate Fellows can also provide public service by speaking to local K-12 schools about their particular research topic, and how they were able to succeed in science and engineering education. Mentor arrangements can be made between university students and at-risk children in the K-12 schools.

Information on educational and job opportunities can be distributed to precollege students by sending flyers to an established mailing list on local science teachers, and by going through educational networks similar to Washington State's MESA (Mathematics, Engineering, and Science Achievement) program.

Once the above procedures are in place, Space Grant programs can work to focus on educational initiatives by directly assisting or augmenting existing educational programs, and where necessary, creating new programs. In Washington State, the Space Grant Program will be writing aerospace science and engineering curriculum kits for use in elementary and secondary level classrooms in state schools. These kits will be distributed through organizations such as MESA, and through the Pacific Science Center. The Pacific Science Center can provide technical and backup support for curriculum development and can assist in educating teachers on the most effective uses of these new curriculum kits.

Developing Educational Initiatives

Space Grant Colleges and Consortia should provide preservice and inservice teachers with science education. One of the major reasons that science education is in a state of crisis is that pre-college teachers are not prepared to teach science effectively. Teachers who are inadequately prepared transmit their feelings of dislike and/or lack of confidence in science to their students. This results in students discontinuing further education in science. To focus students' attention on aerospace science and engineering education, the teachers themselves must be well prepared, articulate, and have a thorough understanding of the science and engineering topics they are teaching. Existing programs for preservice and inservice teachers can be augmented by providing financial, technical, or administrative support to science and engineering departments for expanding teacher education programs and by providing financial incentives to preservice teachers to continue with a science/engineering education. Teacher education can also be improved through aerospace enrichment programs for preservice and inservice teachers and by providing curricula for teachers to use in their classrooms. Another mechanism for reaching the teachers is through summer workshops for continuing education credit. These workshops can focus on current aerospace science and engineering research and bring the teachers up-to-date in this field. Teachers that are motivated and excited about science will motivate their students to continue with science and engineering studies.

Space Grant programs should provide financial support for education. The Fellowship portion of the Space Grant Colleges can provide a great deal of support for graduate students. In addition, Space Grant programs can provide undergraduate support, and financial support for inservice teachers to continue with their continuing education. Small financial incentives can also be offered to outstanding high school students. These forms of financial support will enable individuals to pursue their aerospace science and engineering interests, where it would otherwise be impossible. This is particularly true for economically disadvantaged and minority individuals.

One of the critical elements of the Space Grant program is the recruitment of minorities and women to aerospace science and engineering fields. By the year 2000, 85% of the new workers will be women, minorities or immigrants. The recruitment of women and minorities to science and engineering must begin at a very young age. Currently, students are identified as being particularly adapt at science or engineering in their early grade school years, and girls, minorities, average and less-able students are filtered out of the science and math tracks. Space Grant Colleges can effect a change by promoting and developing programs such as Washington State's MESA program.

The MESA program targets underrepresented minorities and women at the junior and high school levels. This program is designed to increase the number of underrepresented minorities and women in the mathematics, engineering, and science-related professions. MESA accomplishes this through a partnership of higher education, school districts, business and industry, and community organizations. Students are required to take a college preparatory curriculum consisting of four years each of mathematics, science, and English, as well as participating in special MESA activities. Specific academic enrichment classes are established in participating schools. In the classroom, special curriculum kits are introduced that include hands-on experiments that provide students with an immediate understanding of how their learning is useful in the real world. In addition, MESA presents achievement awards for high scholarship, provides tutors, sponsors summer enrichment programs that expose participants to current research being conducted at local colleges and universities, provides academic/career counseling, holds academic competitions and conferences, and offers field trips to local industrial plants, research centers, universities, engineering firms, and computer centers. The success rate of this type of program is very high; 80% of the students enrolled in MESA programs in secondary schools go on to college.

To interest and motivate students to study aerospace science and engineering, Space Grant programs can design new hands-on experiments to teach students about aerospace science and engineering. These experiments can be distributed through educational organizations such as MESA, and directly to teachers. Educational programs can also be initiated through local science centers, such as Washington's Pacific Science Center. The Pacific Science Center (PSC) currently provides science camps for adults and children, a "science champions" program, family workshops, science celebrations for children, and on-site instructional programs at the Science Center. They also provide van programs that travel through the state to K-8 schools. The vans come into schools, hold an all-school assembly, set up hands-on experiments in the hallways, and give 45 minute interactive lectures to the individual classrooms. The vans are set up with various themes, such as Stars and Snakes, Water on Wheels, and Blood and Guts. These vans provide current information on science, as well as motivating and exciting young students to pursue science as "fun." Children remember what they have learned from these "Pacific Science Center Van Days" much longer than something they learned from books, and they also learn to like science. Space Grant programs can fund the development of additional vans, based on aerospace themes. PSC also develops curriculum kits ready-made for classroom use. Washington's Space Grant Program is planning to collaborate with PSC on writing aerospace curriculum kits. The Pacific Science Center is also involved in teacher education, In 1989, PSC held workshops for 3500 teachers on various science and engineering topics, stressing interactive methods of teaching science and mathematics. Space Grant programs can tie in with strong programs such as these, and can augment the existing curriculum for teachers by adding aerospace topics.

In summary, the Space Grant program can help to focus existing and developing educational initiatives by improving science and engineering education at all levels--K-12 science and engineering education of pre-college teachers, and by keeping the public aware of aerospace research and education. At the same time, Space Grant programs can act as clearinghouses for aerospace science and engineering educational and job opportunities.