

## **A. Formal Education Opportunities**

The Commission applauds the recent focus on education at NASA, as evidenced by its mission statement: "... to inspire the next generation of explorers ... as only NASA can," and the extensive education initiatives of the NASA Education Enterprise. The agency is in a unique position to engage young people in their studies through the excitement of space exploration. NASA's current efforts in formal education are generally successful but could benefit from consolidation of implementation and expansion of effort – especially in the training of current and future teachers.

To maximize the impact of space-related programs in education, NASA should enlist the cooperation of the Department of Education and the National Science Foundation – the two other federal government agencies that have "education" in their charter. These agencies should work together with state and local political leaders to infuse the excitement associated with exploring space into science, math, and technology education programs across the country. They should collectively establish a more aggressive approach for encouraging youth to enter math, science, and engineering professions.

The Commission believes the greatest impact will come from expanding programs to train teachers of science, mathematics, and technology. Future efforts should include in-service active teachers and pre-service teachers, i.e., those who are still in training in university and college programs. Such efforts should focus on providing engaging, state-of-the-art content aligned with existing national science and technology education standards, and emphasize approaches that allow students to experience first-hand the thrill of discovery and innovation.

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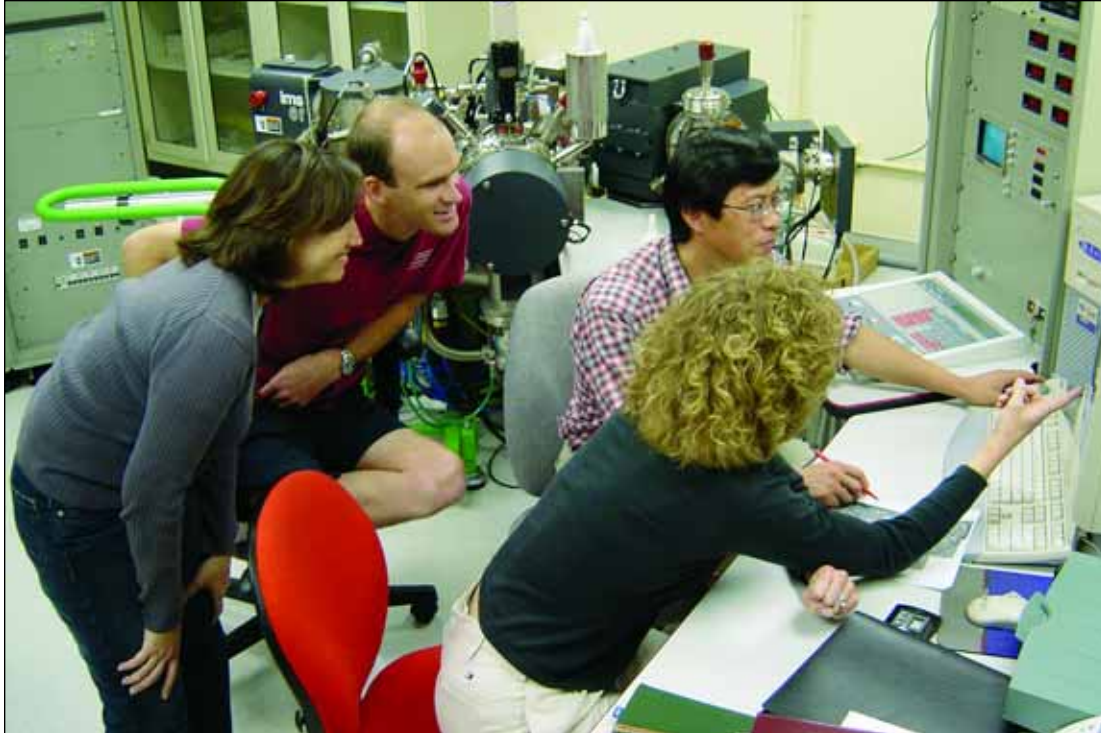
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In addition to enhanced interagency cooperation within the government, the Commission believes that expanded formal K-12 education efforts by industry, universities, and professional associations are needed, and that NASA should strive to integrate its educational efforts with those of these other interested stakeholders. In order for the vision to be as inclusive as possible, education programs need to target and recruit under-represented populations in the fields of math, science, and engineering, particularly those who represent America's emergent demographic. These educational activities contribute directly to the future prosperity of our nation. Everyone involved in exploring space today can make a difference for tomorrow by using the excitement of space exploration to engage the broadest possible cross section of America's children in learning math, science, and engineering.

## **B. New University Partnerships to Train the Next Generation of Explorers**

The Commission suggests that NASA use strategic investments to engage universities in training the workforce capable of taking us on the exploration journey. From astronauts to systems engineers to space scientists, a workforce of great technical skill in their chosen disciplines will be required to implement the system of systems that will accomplish the space exploration vision. However, given the breadth and operational complexities presented by the vision, this next generation workforce will need significant inter-disciplinary experience as well.



One of the benefits of the new vision is to ignite the enthusiasm of students to study science and technology. (Source: Laurie Leshin)

At present, there are insufficient methods for students to acquire hands-on experience in the scientific and technical disciplines necessary for space commerce and exploration. Therefore, a new alliance between NASA and universities should be formed. This alliance will provide hands-on training to future space scientists and engineers and produce the next generation workforce required to implement the space exploration vision. NASA and interested universities should work together to create a “virtual”

### **Recommendation 8-1**

*The Commission recommends the Space Exploration Steering Council work with America’s education community and state and local political leaders to produce an action plan that leverages the exploration vision in support of the nation’s commitment to improve math, science, and engineering education. The action plan should:*

- *increase the priority on teacher training;*
- *provide for better integration of existing math, science, and engineering education initiatives across governments, industries, and professional organizations; and*
- *explore options to create a university-based “virtual space academy” for training the next generation technical work force.*

space academy, the goals of which are: 1) to provide tangible experiences that prepare students for a future in a space-related field, and 2) to bridge the divide between engineering and science training.

The space academy would be funded by NASA, but would take advantage of the “bricks and mortar” as well as intellectual infrastructure already in place in America’s universities, allowing both a rapid start to the program and for it to be infused throughout the nation’s higher education system. The program would consist of university-based science and engineering experiments to train young scientists and engineers, and summer internships. The experiments would be designed to provide senior undergraduate and/or graduate-level experience for integrated engineering/science teams that teach systems engineering and science/engineering integration through conceptual designs relevant to both robotic and human space missions. Through the space academy program, students would develop projects with science and exploration objectives and engineering implementation, culminating in a mission design. By participating in academy programs, affiliated universities would develop curricula and facilities and produce a workforce imbued with state-of-the-art capabilities.

The space academy program could consist of one-year courses with NASA as content advisor. Individual academic institutions would be tasked to decide how the program could fit within their existing program, but the Commission suggests that the courses could constitute a senior design project or a component of a first year master’s degree in engineering or science. Once established, the university-based program could be expanded so that participants spend one or more summers at NASA Centers, with industry partners, or at another academic institution, dividing time between a group project and an internship. Completion of the year-long course and summer program would yield a space academy certificate and serve as a credential, but any degree would be granted by the participant’s home institution. Many NASA Centers currently implement successful educational programs that could be adapted to the space academy program, but it is expected that the content would be driven by a shared vision – between NASA and participating institutions – of the skills needed to train future space scientists and engineers.

### **C. Public Engagement**

The entire nation, indeed the world, will be watching as we explore new frontiers and answer profound questions on our journey into space. In fact, public participation is critical to sustaining the space exploration vision. The American people – the taxpayers who pay the bill – must assert ownership of the space program that transcends politics and the political environment.

Based on the testimony of witnesses involved in education, outreach, and the media – as well as on public comments received – the Commission believes a new model is needed to expand the role of space exploration in our culture. Working together, the White House, NASA, industry, and professional organizations can forge a new model for public engagement built on grass roots support. Such support requires sustainable, systematic, effective marketing and communication programs, employs professionals who are trained in the art and science of communication, and uses new, and even novel means for communicating with the public about space.

#### **Recommendation 8-2**

*The Commission recommends that industry, professional organizations, and the media engage the public in understanding why space exploration is vital to our scientific, economic, and security interests.*