

# *Reach for the Stars!*

*A Strategy for Encouraging Women, Minorities and People with Disabilities to Pursue Careers in Science, Technology, Engineering and Mathematics*



*A Joint Effort of Easter Seals, The University of Maryland Eastern Shore, NASA, and the Tri-County Council*



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## 1.0 Background

In its 2006 Report of Science and Engineering Indicators, the National Science Foundation reported that Science & Engineering (S&E) employment grew between 1990 and 2000 at a 3.6% average annual rate compared with 1.1% for the whole workforce. At the same time, S&E degree production grew by a smaller 1.5%. In addition, 29% of all Engineering Degree holders are over age 50. As a nation, we are rapidly approaching a shortage of Scientists and Engineers in the United States. If this shortage continues, the rapid growth in research, development and innovation that the United States has experienced since World War II may no longer be sustainable.

While there are many programs focused on encouraging students to pursue careers in Science, Technology, Engineering, and Mathematics (STEM) disciplines, very few programs are targeted for students with disabilities. *All too often, youth with disabilities are separated out into jobs in the five F's: filing, food, flowers, filth, and folding.* While there is no shame in this type of work, the assumption that disabled youth are only able to perform in these types of environments means that many students will be steered into careers that do not take full advantage of their potential. This not just a loss for the individuals involved, it is a loss for our nation. The ability of the United States to remain at the forefront of technology innovation depends upon our ability to engage, and encourage and inspire people with the ingenuity to invent new tools, the passion to solve problems and the courage to ask difficult questions to join our workforce. People with disabilities represent a relatively untapped source of creative, intelligent people who are critical to our country's future success. If we fail to include them, we will lose bright, capable, people that can help us meet our future goals.

STEP UP (Science, Technology, Engineering Pipeline for Underserved Populations) is a collaborative effort of federal, state, educational and community agencies that have joined together to develop the technology workforce of tomorrow. Current members of the STEP UP collaboration include NASA Wallops Flight Facility, Worcester County, MD, Lower Shore Workforce Alliance, Salisbury University, WorWic Community College, Maryland HAWK Corporation, the Maryland Institute for Space Technology (MIST), and the University of Maryland Eastern Shore (UMES).

STEP UP takes the innovative step of creating actively collaborative communities. This collaboration joins local schools with industry, institutes of higher education, government and community resources to encourage students to pursue STEM careers. High school students have the opportunity to work side by side with NASA professionals. They gain exposure to careers in engineering and the sciences, and develop workplace skills that put them ahead of their peers. The participating colleges and university personnel have the opportunity to identify and recruit these highly motivated students. The students make contacts with higher education professionals that can provide them guidance and future opportunity. University students gain experience, and insight that enhances their education as well as their employment prospects. The students in this program literally get a 'step up'. The payoff for this effort is a diverse and competent future workforce. Success will be measured by participants' choice to pursue higher education in STEM Disciplines, by improved academic performance of its participants, and by the entrance of



these participants into the future knowledge-based workforce.

The STEP UP initiative has made a concerted effort to recruit and retain students with disabilities and economically disadvantaged students. During the first three years of the program, we found that by the time they reach high school age, most students in these populations have already lost interest in science and engineer careers. That knowledge was the basis for our decision to extend the STEP UP pipeline to the middle school population.

## 2.0 The Problem – Why Students don't pursue STEM Careers

Tracy Camp's *The Incredible Shrinking Pipeline* gives us some insight into the factors that prevent women from pursuing careers in STEM disciplines. There is a significant body of evidence that indicate that minorities and people with disabilities face similar issues. Specifically, the following items pose significant barriers to the pursuit of a STEM career:

- Limited career exposure
  - Students have no first-hand knowledge of what Engineers and Scientists do on a day to day basis.
  - Many students reported that they had never considered a STEM career
- Lack of access and recruitment to University Engineering Programs
  - This is a particular issue for students with disabilities. There are not adequate support services for many students with disabilities, and even fewer institutions of higher education that actively recruit students with disabilities.
  - Minority and female students report that few universities recruit them for STEM programs.
- Lack of encouragement from School, Home and Community
  - Because STEM careers are seen as traditionally white, male and non-disabled professions, there is often social pressure for students who do not fit this demographic not to pursue such careers
- Lack of assistance with Math/Science homework.
  - Many students from underserved populations do not have a parent at home that can assist them with complex science and mathematics activities.
- Lack of Role Models in Science and Engineering Fields
  - There are few visible scientists and engineers that are have visible disabilities or are female or from minority populations.

STEP UP is structured to address each of these issues. By providing high school and university internships, students learn first hand what engineers and scientist do on a daily basis. Our university partners provide a real and visible presence to actively make students aware of their opportunity for education in STEM fields.



STEP UP's true innovation is in its community participation. The local community provides one third of the funding for STEP UP interns. More importantly, the community provides the academic and social support that students who do not traditionally pursue careers in STEM disciplines may lack. The Worcester County Commissioners host a lunch for all STEP UP interns each year. Students are given the opportunity to talk about their experiences as STEP UP interns to the commissioners. NASA mentors keep in touch with students during the school year, to provide encouragement and guidance to students as they navigate their academic careers. Beginning in 2007, STEP UP students will be eligible for online homework assistance in math and science from live tutors.

While the STEP UP experience is beneficial to all youth, it is particularly valuable for youth with disabilities. Research demonstrates that work experiences for youth with disabilities during high school helps them acquire jobs at higher wages after they graduate (Blackorby & Wagner, 1996; Colley & Jamison, 1998; Luecking & Fabian, 2000; Rogan, 1997). This becomes even more critical when one examines the employment statistics for People with Disabilities in the state of Maryland.

Youth with disabilities continue to actively struggle to achieve success in the labor market. They are frequently channeled into inadequate education for work programs because of low expectations and/or discriminatory assumptions about disability. (Fairweather & Shaver, 1990; Rojewski, 1996) According to the Rehabilitation Research and Training Center on Disability Demographics and Statistics at Cornell University ([www.DisabilityStatistics.org](http://www.DisabilityStatistics.org)), in 2005, 10.4 percent of working age individuals in Maryland reported a disability. Forty-three percent of working age people with disabilities had at least some college or a Bachelor's degree or more compared with 65.6 percent of people without disabilities. 42.8 percent of people with disabilities were employed compared to 81.7 percent of people without disabilities. 18.4 percent of working age people with disabilities live in poverty compared to 5.6 percent of people without disabilities.

STEP UP seeks to provide students with disabilities opportunities to participate in structured high-quality programs designed to help them make informed choices about careers they may want to pursue. We seek to reverse the trend of channeling students with disabilities into inadequate educational and career programs. To do this effectively, we must begin early by providing students with disabilities early access and training in STEM disciplines.

In the November 2006 issue of the National Science Teacher's Association (NSTA) digest, NSTA president Linda Froschauer reported:

*“We have evidence that the STEM pipeline is closing for our students. A component of that problem is that they are not prepared to enter the pipeline offered to them. It's essential that they develop conceptual understanding in science and math to be prepared to enter that pipeline and university STEM*



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coursework...

*...We must provide more opportunities for students to become involved in upper level, rigorous course work. Opportunities such as magnet schools and internships need to be provided as alternatives for students who indicate interests in STEM careers. Set the bar high. Students must be provided the challenge with the accompanying support necessary to succeed.”*

Clearly, if we are to succeed, we must begin our pipeline efforts well before students reach their high school years.

### **3.0 STEP UP Plan for Middle School Students**

The plan to include middle school students in the STEP UP program has four primary goals:

1. To inspire and excite the next generation of scientists and engineers by providing students with real-world hands-on experience in science and engineering
2. To expose students to careers in STEM disciplines, particularly women, minorities, and people with disabilities
3. To help students develop the skills necessary to succeed in the math, science and technology courses that will allow them to pursue STEM careers
4. To show students the clear path of opportunity for them to pursue careers in science and engineering.

### **3.1 2007 REACH FOR THE STARS! STEP UP Summer Balloon Science Camp**

In July 2007, STEP UP will hold a 12-day camp that is focused on rocketry and atmospheric balloon science. This residential camp will be held on the campus of the University of Maryland Eastern Shore, and will be a cooperative effort of the STEP UP collaboration and Easter Seals. The camp will host 27 students from Worcester, Wicomico, and Somerset Counties. Nine of the students will have physical disabilities, nine students will from the population of students considered ‘at risk’ for academic failure, and nine students will be from the population considered to be ‘gifted and talented’.

The technical staff of the camp will consist of NASA engineers, engineers from the UMES HAWK corporation, and high school and university STEP UP interns. This staffing arrangement will allow the middle school students to see that there are internship



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opportunities available to them as early as high school if they choose to work hard and succeed in STEM academic subjects. In addition, the students will be able to physically see the pipeline from camper to high school intern to university intern to employee.

Support services for the students with disabilities and for behavioral supports will be provided by Easter Seals of Delaware & the University of Maryland Eastern Shore (UMES) employees, and from interns from the UMES Department of Rehabilitation Services. This will allow students with disabilities to fully participate in all aspects of the programs. In addition it will allow students who are pursuing careers in rehabilitation sciences to get real-world experience working with people with disabilities and to personally witness that students with disabilities are capable of pursuing careers *that engage their full range of intellectual and personal abilities.*

During their 12 days at the REACH FOR THE STARS! Camp, students will learn about rocketry and balloon, atmospheric science. They will receive instruction from scientists and engineering working in the field, with support from STEP UP technical interns. Students will have the opportunity construct and launch small model rockets so that they can learn about the principals of space flight first hand. They will travel to NASA Wallops Flight Facility's Range Control Center to participate in a simulated rocket A launch to experience the thrill of mission control. Following that, , students will have the opportunity to participate in the assembly and launch of a two stage rocket at the UMES football field.

During the balloon and atmospheric science units, students will have the opportunity to design and assemble their own small balloon payloads to conduct atmospheric experiments. The experiments may be as simple as placing sunscreen on half of a rock, so that the student can see the difference in fading of the rock with and without sunscreen to learn about the effects of UV radiation, or they could be as complex as conducting temperature, pressure, humidity and other measurements, and recording the results real time on a laptop computer using telemetry equipment. The complexity of the experiments will be determined by the student's desires and ability.

Students will attach their experiment to small, weather-type balloons. With the assistance of engineers and STEP UP technical interns, the students will launch their experiments at the UMES football field. They will have the opportunity to feel the excitement as their experiment rises up in the sky, and they can view the results. Following their experiments, the students will have the opportunity to analyze and debrief the results of their experiments.

Throughout the camp, the middle school students will be exposed to various types of careers in the engineering and science fields. They will visit the NASA Wallops Island Facility, and have the opportunity to meet with scientists and engineers who are national leaders in the fields of oceanography, rocket science, unmanned aerial vehicles, aviation, and scientific ballooning. Visiting faculty from UMES and other universities will spend time with the students and help them to see the opportunities that await them. We recognize that the summer is also vacation time for students. The camp



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programming includes recreational activities such as a trip to Assateague Island, and to the Wild West Show in Chincoteague Virginia. Ice cream, movies and other activities are on the agenda, because just having fun is central to any summer camp experience.

#### **4.0 Evidence That This Approach Will be Effective**

The National Collaborative on Workforce and Disability for Youth reports that work-based learning sponsored by an education or training organization that links knowledge gained at the worksite with a planned program of study helps youth to develop critical basic workplace skills like teamwork, communication, problem-solving, customer service and social etiquette skills. By learning in a work-based setting, students are able to understand different industries in order to make informed career choices.

Increasingly, employers and professional licensing agencies are requiring new professionals to complete an internship so they can develop the specific competencies required for their workplace. While work experiences are beneficial to all youth, they are particularly valuable for youth with disabilities. For youth with disabilities, one of the most important research findings shows that work experience during high school helps them get jobs at higher wages after they graduate (Blackorby & Wagner, 1996; Colley & Jamison, 1998; Luecking & Fabian, 2000; Rogan, 1997).

Creating quality work-based learning for youth with disabilities presents additional challenges, including the student's lack of exposure to an array of career options and industry settings, insufficient staff to help youth learn how to access the necessary assistive technologies and other support services. STEP UP has developed a program that will provide those opportunities and provide the support necessary to assure the student's success.

STEP UP is more than a program to assist students with disabilities. The intentional diversity in the STEP UP structure provides all students with opportunity to develop both their technical skills and the ability to collaborate with students and professionals that may be very different from themselves. The result is the highly trained, diverse workforce that will help us to remain at the international forefront of technology development and application. STEP UP provides students and our nation a 'step up' to a bright future.



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