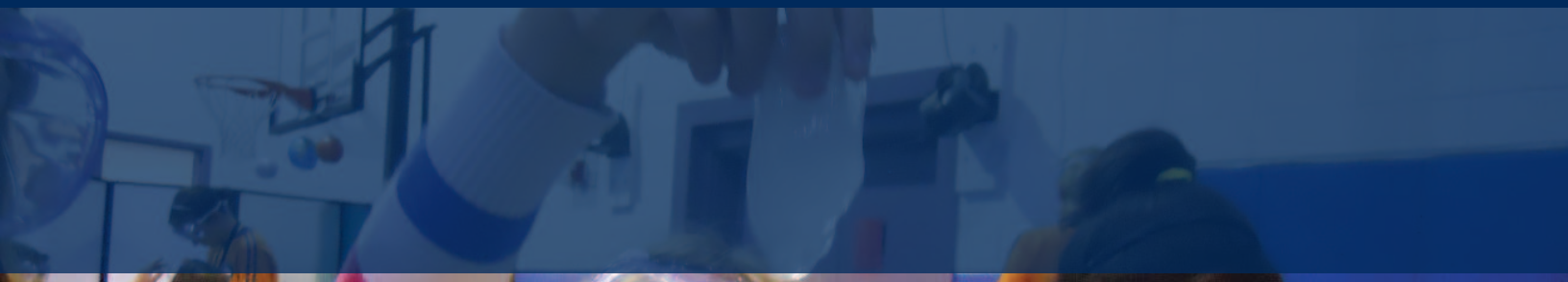
National Aeronautics and
Space Administration

2011 Johnson Space Center Education Annual Report



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Director's Letter

What does the future look like for our children, grandchildren, nieces and nephews? What will our space exploration vision be 50 years from now and how will new discoveries from research in space impact our lives? At Johnson Space Center, questions about the future and the place of young people in it influence how we approach education. For success as a space center and as a nation, we need to provide our future workforce with the right skills and abilities to become critical thinkers and problem solvers.

American students trail far behind their international peers in science, technology, engineering and math (STEM) disciplines. The United States was once the leader in STEM fields, but now we're not even ranked among the top 15 developed nations in science and math. To remain a preeminent nation that pushes the boundaries of space exploration and develops new technologies with applications on Earth, we must invest in future engineers and scientists. This investment starts with our children and educators, primarily those in middle school grades where students often begin to embrace interest in science and math or lose interest in it.

A significant way to impact large groups of students and educators is through collaborations and partnerships. In 2011, NASA partnered with numerous minority serving institutions to inspire technological advancements in academia. The NASA Aerospace Scholars program further expanded beyond Texas, reaching a wider range of high school students and middle school teachers to share the excitement of human spaceflight. JSC piloted a hands-on engineering experience for girls with representation from 25 states and the District of Columbia, and initiated partnerships with commercial entities such as LEGO, Sesame Street and Google. Each partner brought its expertise to the table and together we developed STEM initiatives designed to inspire and engage students in science and math.

NASA is committed to using its unique assets to inspire and educate children of all ages and equip educators with STEM content that can help ignite student interest.

Sincerely,

Michael L. Coats
Director, Johnson Space Center

NASA Education

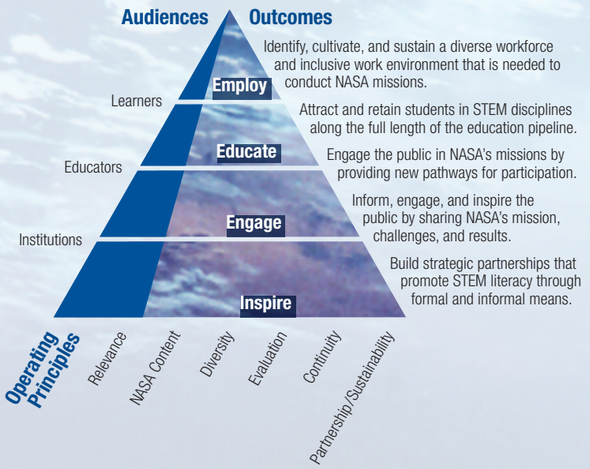
NASA's Johnson Space Center in Houston strives to improve STEM education while increasing interest and awareness in all NASA careers. JSC is dedicated to inspiring, engaging, educating, and employing the next generation of explorers and innovators by offering programs for students and educators, sharing classroom resources, and collaborating on numerous partnerships with other educational entities.

NASA's journeys into air and space have deepened humankind's understanding of the universe, advanced technological breakthroughs, enhanced air travel safety and security, and expanded the frontiers of scientific research. These accomplishments share a common genesis: education. As the United States begins the second century of flight, the nation must maintain its commitment to excellence in STEM education to ensure that the next generation of Americans can accept the full measure of their roles and responsibilities in shaping the future. NASA will continue the agency's tradition of investing in the nation's education programs and supporting the country's educators, who play a key role in preparing, inspiring, exciting, encouraging, and nurturing the young minds of today who will be the work force of tomorrow.

NASA continues to pursue three major education goals:

- Strengthening NASA and the nation's future workforce
- Attracting and retaining students in STEM disciplines
- Engaging Americans in NASA's mission

NASA's STEM Education Framework



Student Educational Opportunities

JSC's Office of Education offers various types of student educational opportunities throughout the year, including onsite programs, research programs and digital learning programs for students from kindergarten through the university level.

Student Employment Opportunities

The Office of Education provides high school and college students the opportunity to gain real-life experience alongside NASA engineers, scientists and business professionals. This hands-on work experience helps develop qualified and diverse graduates to meet future workforce needs and really helps students launch their careers.

Educator Opportunities

JSC's Office of Education offers programs for educators. Opportunities include onsite workshops, traveling clinics and digital learning programs aimed at helping teachers implement NASA's unique content into their science, math and technology instructional materials.

Education Design Team Recommendations for 2011

- Focus the NASA Education Program to improve its impact on areas of greatest national need
- Identify and strategically manage NASA Education partnerships
- Participate in national and state STEM education policy discussions
- Establish a structure to allow the Office of Education, Centers and Mission Directorates to implement a strategically integrated portfolio
- Expand the charter of the Education Coordinating Committee to enable deliberate education program design
- Improve communication to inspire learners

JSC Education Highlights

JSC's Office of Education provided a host of unique educational activities for K-16 students and educators during 2011. The center's education specialists used science, technology, engineering and mathematics content from space exploration to inspire future explorers. The best and brightest moments of the year are highlighted below.

The Teaching from Space office partnered with many groups throughout the year to bring unique experiences to children all over the country. By reaching out to young audiences TFS stimulates interest in NASA's missions and in science, technology, engineering, and mathematics (STEM) education. Some of the special opportunities offered during 2011 included:

- Working with NASA Headquarters and Sesame Street to coordinate a high profile visit from Elmo to the final space shuttle mission pre-launch activities
- Collaborating with the National Institute of Aerospace to commemorate the history of the Space Shuttle Program with an artwork competition for students ages 9 to 17. The winning students received cash prizes and mentoring from USA Today graphic artists

- Helping students engage in a live amateur radio contact with space station crewmembers, where they were able to ask questions about life, work and research in space

NASA's Summer of Innovation initiative provided the opportunity for JSC to collaborate with 8 educational organizations to design and implement summer STEM learning programs for students in grades 4 through 9, reaching approximately 1,700 students. JSC worked with the collaborators to strengthen efforts to engage underrepresented and underserved middle school students in STEM learning by using exciting and rigorous NASA-based instructional resources, experiences and support tailored to local needs.

NASA Aerospace Scholars expanded by offering the program in new locations and initiating a pilot week geared toward high school girls. This expansion included:

- NASA Community College Aerospace Scholars offering a hands-on engineering-based experience at the Jet Propulsion Laboratory in California
- Texas Community College Aerospace Scholars program signing a Space Act Agreement with the Dallas Community College District to offer a standalone session just for the district's students, due to a high volume of qualified candidates in Dallas

- The Women in STEM High School Aerospace Scholars, or WISH, supported the president's call to encourage women and girls to pursue STEM fields

Mission X 2011 Challenge increased awareness of the importance of lifelong health and conditioning; taught students how fitness plays a vital role in human performance for exploration; and motivated students to pursue careers in science, technology, engineering and mathematics (STEM). Approximately 3,750 students from more than 25 different cities worldwide participated in this six-week pilot project. Team USA, from College Station, TX, celebrated the end of the challenge with the NASA Associate Administrator for Education, Leland Melvin.

The Reduced Gravity Education Flight Program worked with other NASA programs and government agencies to offer a unique research opportunity in microgravity to new participants comprising 55 different teams. These partnerships included:

- Working with Teaching from Space to bring in 21 teams representing 10 different states. Applications were open to any group of high school educators or students to purpose, design, fabricate, fly and evaluate an experiment in a reduced-gravity environment

- Offering the research opportunity to students attending minority serving institutions and community colleges, with assistance from NASA Headquarters' Office of Education and the Minority University Research and Education Program
- Collaborating with the National Space Grant Consortium to offer a flight week to students attending colleges and universities affiliated with Space Grant consortia

- Teaming with the United States Department of Energy's Princeton Plasma Physics Laboratory to offer K-12 educators this unique platform for research

The Student Employment Program Office worked with a number of funding sources and organizations throughout the center and agency to offer internships to a record number of students. The collaborations highlights included:

- Recruiting, interviewing, funding and placing a record 42 students during the spring, 143 students during the summer and 80 students in the fall, including 58 yearlong Career Exploration Program interns
- The Undergraduate Student Research Program generating 453 internships across the agency, including 64 at JSC, as NASA's largest internship program for undergraduate students in STEM fields. More than 175 of these students were placed in the spring, exceeding the previous record by 72
- Implementing SOLAR, an agency tool to collect applications, assist placements and confirm positions

JSC collaborated with the University of Texas at Pan American to celebrate the 10 year anniversary of the Hispanic Engineering, Science and Technology Conference. During the weeklong forum, JSC team members supported education activities and events attended by 11,000 members of the community. Highlights from the conference included Deputy Johnson Space Center Director Dr. Ellen Ochoa supporting the congressional dinner and roundtable and a question-and-answer session with astronaut Mike Fossum on board the International Space Station.

Ralph C. Steckler Space Grant project managers announced the five recipients of Phase II funding. The universities received awards totaling over $2.2 million for the continuation of their research for space colonization in the areas of operations, environmental control and life support systems, and power. Steckler grantees also provided hands-on internships to 18 undergraduate and graduate students.

The 17th Annual Space Exploration Educator's Conference took place at Space Center Houston where teachers attended professional development sessions on topics such as space suits, lunar certification training and robotics. Several activities provided the teachers with a one-on-one chance to speak individually with NASA education team members about ways to use NASA resources to engage students in STEM subjects. Over 500 teachers from across the United States, Canada, Japan and the United Kingdom attended the conference, which included sessions presented by astronauts, engineers, scientists and education specialists.

JSC Education Impact

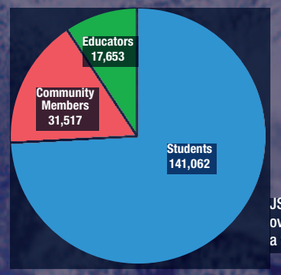
JSC strives to reach the most diverse and brightest minds across the country with its education projects. Each dot represents a group that took part in a JSC-managed education project in 2011. The impact created on a local, state, regional, and national level is visible.

ALASKA

HAWAII

PUERTO RICO

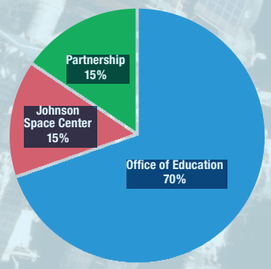
US VIRGIN ISLANDS



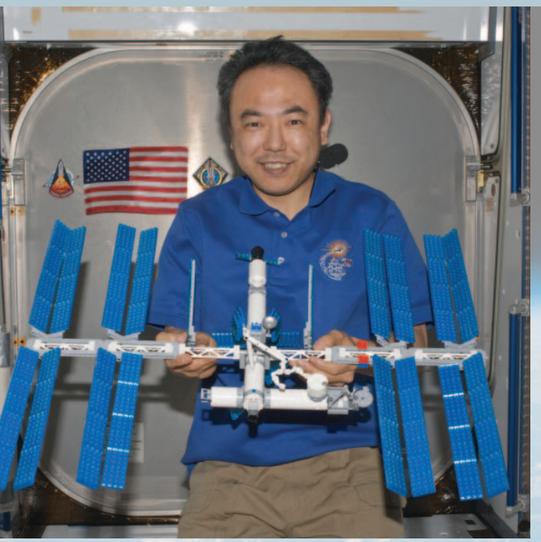
JSC's Education Office involved over 190,000 individuals through a variety of activities in 2011

JSC Education Partnerships

JSC's Office of Education continues to strengthen interest in science, technology, engineering and mathematics by leveraging the excitement of human space exploration. Through new strategic partnerships and collaboration we're evolving to meet the Nation's future workforce needs. The following is a sampling of what we believe will be a growing trend in how we deliver and leverage NASA unique resources:



JSC's Office of Education projects were made possible through funding contributions from the agency, the center, and our partners.



Strategic Business Collaboration

- YouTube/Google/Space Adventures
- LEGO
- USA Today

Intergovernmental Agreements

- United States Department of Energy
- State of Texas
- San Jacinto College Aerospace Academy

University Collaboration

- New Mexico State University
- University of Texas Pan American
- Boise State University
- University of Houston System

Non-profits and Associations

- Sesame Street
- Sally Ride Science
- American Chemical Society
- National Science Teachers Association

JSC Education Projects

JSC Education strives to reach students, educators and the general public through a variety of projects. These projects reach not only the area surrounding JSC, but also JSC's 8-state region and the entire country. The activities found within these projects focus on STEM related topics and include things like professional development for educators, hands-on activities for students, unique NASA experiences, student internship and employment opportunities, and online learning. A brief overview is provided of each project managed or operated through JSC Education.

Higher Education and Student Programs

Career Exploration Program: Acts as a career catalyst for local high school and college students by providing yearlong experiential internships at JSC while the students are enrolled full-time in their degree programs. Students work under the guidance of a NASA mentor to develop professional skill sets and provide technical and administrative support to JSC organizations.

Graduate Student Researchers Program: An agency-wide fellowship program for graduate study leading to masters or doctoral degrees in a science, technology, engineering or mathematics (STEM) field, related to NASA research and development.

Harriett G. Jenkins Pre-doctoral Fellowship Project: Provides up to three years of support for STEM education to underrepresented persons (women, minorities and persons with disabilities) and includes a mentor-protégé initiative, fellows orientation, a technical exchange symposium and the competitive mini research award program.

ISS National Laboratory Education Project: Serves as a focal point for STEM education which utilizes the unique educational venue of the International Space Station. The ISS NLEP serves as the premiere NASA resource that enables educational activities onboard the space station and in the classroom.

Minority University Research and Education Program: Increases the agency's responsiveness to federal mandates related to minority institutions via competitive award programs, faculty fellowships and student intern activities.

Motivating Undergraduates in Science and Technology: Awards scholarships and summer internships to undergraduates pursuing degrees in STEM fields, as well as year-round tutoring, lecture series and mentoring from STEM faculty and peers.

National Community College Aerospace Scholars: Encourages community college students from across the nation to explore the possibilities of careers in STEM disciplines while engaging in activities to experience engineering first hand.

NASA Space Technology Research Fellowship: Open to graduate student researchers pursuing advanced degrees in Science, Technology, Engineering and Mathematics (STEM). Selected candidates will perform graduate student research at their respective campuses and at NASA Centers and/or nonprofit U.S. Research and Development (R&D) laboratories.

Pre-Service Teacher Institute: Provides intensive, one-week summer residential sessions designed to increase student skills in teaching mathematics and science, while incorporating technology into the curriculum for early childhood, elementary and middle school Education (K-8) majors.

Reduced Gravity Education Flight Program: Provides undergraduate students and educators with unique academic experiences to successfully propose, design, fabricate, fly, and evaluate reduced-gravity experiments over the course of four to six months.

Space Grant Interns: Funded through Space Grant Consortiums across the U.S. to provide experiential opportunities for graduate and undergraduate students at NASA and private industry partners.

Steckler Space Grant: Awards grants of increasing value to institutions addressing innovative, meaningful, and enduring research and technology development activities that could enable space colonization or space settlement.

Student Temporary Employment Program: Provides "hands-on" career-related work experiences for graduate business program students by placing them in mentor-directed positions in JSC's professional administrative fields such as Accounting, Procurement, Human Resources or Education for summer, spring, or fall semesters.

Systems Engineering Education Discovery: Utilizes a variety of existing programs and new tools to lead the Agency in development and growth of a new generation of systems engineers better prepared to contribute immediately upon entering the workforce.

Texas Aerospace Scholars Interns: Attracts outstanding students to an internship opportunity at JSC. Eligible students for the internship must be a TAS alumni, which encompasses former student participants of High School Aerospace Scholars and Community College Aerospace Scholars. Qualified applicants must be pursuing an undergraduate degree in a STEM-related field.

Texas Community College Aerospace Scholars: Encourages community college students to explore the possibilities of careers in STEM fields while engaging first hand in engineering activities.

Undergraduate Student Research Program: An agency-wide undergraduate internship program offering semester and summer opportunities at 12 NASA centers and facilities. USRP provides students the ultimate workforce preparatory experience for STEM careers by offering 10-15 week hands-on mentored internships.

University Research Center: A competitive cooperative agreement used to increase research content consistent with NASA's vision for aeronautics and space exploration capability among the nation's minority serving institutions.

Elementary, Secondary and E-education

Aerospace Education Services Project: Offers professional development efforts, educator training and identification of NASA resources to the formal and informal education communities in all fifty states and the U.S. territories.

Astromaterials Research and Exploration Science Directorate: Loans lunar rocks and soils imbedded in acrylic to trained educational institutions through the JSC Lunar and Meteorite Sample Education Disk. The education team also provides development and assessment of education materials, training workshops for educators and university staff and advisory support for the loan programs.

Digital Learning Network: Provides interactive programming via videoconferencing and webcasts that inspires students to pursue STEM disciplines while learning more about our home planet, NASA's missions and research.

Educator Resource Center: Guides educators to NASA educational technologies, programs, and curriculum by demonstration and pre/in-service training.

Expedition Earth and Beyond: Brings the excitement of exploration, discovery, and the process of science to the classroom through meaningful connections with scientists, educator trainings, and standards-aligned inquiry-based activities and resources using stunning astronaut imagery taken from the International Space Station and remote sensing imagery of other planetary worlds.

High School Students Unite with NASA to Create Hardware: Works with middle school and high school students to fabricate training, flight hardware, and soft goods for the International Space Station. NASA supplies the mentor, documentation, and raw material to provide students the opportunity to work on real-world projects.

Human Research Program Education and Outreach: Uses formal and informal education venues, as well as public outreach events, to share NASA's space research and the challenges of human space exploration. HRPEO, along with highly qualified educational partners, creates Math and Science application problems based on NASA content for grades K-12.

Informal Education: Partners with museums, science centers, and informal educational groups, such as scouts, afterschool groups and camp programs in JSC's eight-state region. These projects and activities seek to build internal and external strategic partnerships that promote STEM literacy and awareness through both formal and informal educational settings.

Interdisciplinary National Science Program Incorporating Research Education Experiences: Links a national student pipeline program of elementary and secondary programs to higher education by encouraging 9th through 12th grade students to pursue STEM education and careers. This project offered an online learning community as well as summer internships.

NASA Explorer Schools: NASA's classroom-based gateway for middle school (grades 4-8) and high school (grades 9-12) classrooms offering unique learning experiences inspired by NASA's missions. NES provides free teaching and learning resources that promote student engagement in STEM.

NASA High School Aerospace Scholars: Partners JSC with multiple states, building on the success of the Texas High School Aerospace Scholars project and replicating the model with a unique online course and summer workshop as inspiration to increase the number of high school students entering STEM degrees and careers.

JSC Robotics: Teams with the University of Houston to bring K-12 robotics education to the greater Houston area through the coordination of Robotics Education program. This program reaches a broad audience by providing schools with high-quality robotics programming in which to participate.

Summer of Innovation: Supports student interest in STEM by strengthening the capacity of community- and school-based organizations that inspire and engage middle school students in STEM content during the summer.

Teaching From Space: Manages NASA's Education Flight Projects, a national K-12 project, and facilitates and funds opportunities for educators and students that utilize NASA unique content, facilities, and people.

Women In STEM High School Aerospace Scholars: Provides an opportunity for girls to participate in an online project and weeklong summer workshop at JSC where they work in teams alongside female NASA engineers and interns to conceptualize and engineer how to send a rover to Mars and back.

For more information, visit:

http://education.jsc.nasa.gov

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