



This has added fuel to the fire I have always had for learning and possibilities with education. I am so excited to share all of the opportunities with other educators and with students. For many students we are their 'window to the world', I am excited to share with them what is possible. Thanks for keeping my fire roaring!

Shelley—Middle School Teacher

2012 Johnson Space Center Education Annual Report



Director's Letter



I'm pleased to share Johnson Space Center's (JSC) 2012 Education Highlights. Across the nation, the conversation about our country's future continues to focus on the importance of science, technology, engineering, and math (STEM). Our ability to grow the number of educators excited and prepared to teach difficult concepts, as well as improve students' success in STEM is crucial to ensuring a competitive workforce.

At JSC, our unique contributions to Human Space Exploration are shared with educators and students across the Nation and across the world, through NASA experiences, professional development, research, and employment. We continue to enhance our portfolio and expand our partnerships to serve the greatest number of participants.

NASA's ability to inspire future generations requires a renewed commitment to innovation, adaptability and a clear focus of our goals. In 2012, NASA's Office of Education launched a new approach to implementing the agency's portfolio. This approach established four lines of business which include STEM Engagement, Educator Professional Development, Institutional Engagement, and Internships, Fellowships, and Scholarships.

We remain committed to supporting national priorities and collaborative movements aimed at dramatically increasing the quantity and quality of STEM educators—ensuring all students have access to first-rate STEM learning. We are ready for the challenge and prepared to make a positive impact!

It is a tremendous honor for me to represent the talented team at JSC and I'm looking forward to a great 2013.

Sincerely,

A handwritten signature in black ink that reads "Ellen Ochoa". The signature is written in a cursive, flowing style.

Ellen Ochoa
Director, Johnson Space Center

NASA Education

NASA's Johnson Space Center (JSC) 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 with educational partners.

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 renew its commitment to excellence in STEM education and ensure the next generation of Americans is prepared to excel in our global economy. NASA's JSC Office of Education will continue to enhance its STEM education programs for our nation's educators and students.

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



Advancing High Quality STEM Education Utilizing NASA's Unique Capabilities

“My experiences with the things I do in CEP have made me realize that I can be and do anything I want to be. I've learned so many things at NASA and I've become more *confident* in myself

Career Exploration Program (CEP) Student,
Johnson Space Center”

NASA Education Framework

Johnson Space Center is launching into the future with four key Lines of Business which will focus our education investments to ensure they are NASA unique and non-duplicative of other Federal Agencies involved in STEM education. The Lines of Business include STEM Engagement, Educator Professional Development, Institutional Engagement, and NASA Internships, Fellowships, and Scholarships.

STEM Engagement (SE)

Johnson Space Center in collaboration with Glenn Research Center and Kennedy Space Center are leading the SE efforts for the Agency. NASA SE opportunities include public education events, experiential learning opportunities, and challenges—all designed to increase learners' involvement and interest in STEM, educate them on the value of STEM in their lives, or positively influence the perception of their ability to participate in STEM by connecting them to NASA-unique resources.



...the kids will never remember my name but they will always remember they got to talk to the astronauts on the International Space Station. Honestly that is what I hope they will remember and to spark their curiosity into the STEM careers that are going to dominate the workforce in the years to come.

Patricia Londono, Mansfield, Texas
Educator at Asa E. Low, Jr. Intermediate

NASA Internships, Fellowships, and Scholarships (NIFS)

Johnson Space Center in collaboration with Ames Research Center are leading efforts for the Agency to invest in the Nation's STEM learners, the workforce of tomorrow, by providing opportunities that will launch a new era of learning, innovation, and achievement in STEM. NASA motivates students to pursue careers in STEM with unique internship, fellowship, and scholarship or NIFS opportunities. These offerings improve the retention of students in STEM disciplines by providing opportunities along the pipeline and increasing the pool of STEM graduates.



My experience at NASA was beyond amazing. You can't get this type of experience anywhere else.

NASA Intern
Texas A&M University

Institutional Engagement (IE)

NASA IE supports the advancement and development of STEM personnel, programs, and infrastructure to enable formal and informal institutions to conduct NASA-related research and/or deliver NASA-related STEM content. The opportunities capitalize on the Agency's strengths and resources, including scientists and engineers, mission and technology portfolios, and world-class facilities. IE will also include efforts to increase STEM research at Minority Serving Institutions, increase collaboration with information education entities, and work with like-minded organizations to advance strategic STEM policy positions and workforce needs.



Both NASA experiences I have had were exceptional. They have linked classroom education to technical experiences. They give you an opportunity to develop all skills both technical and communication.

Quincy Fitzgerald Johnson
Prairie View A&M University

Educator Professional Development (EPD)

NASA inspires, educates, and supports our Nation's educators, who play a key role in preparing, inspiring, exciting, encouraging, and nurturing the future STEM workforce. EPD at NASA increases an educator's confidence to deliver STEM materials within their education environments by leveraging NASA's unique content, facilities, and personnel.



What a fantastic week. The best of my teaching career. During our time there and upon our return to school, the atmosphere in our school community was overwhelming. Teachers, students and the community were all very interested and inspired by our involvement in the program. I have not seen our school community so excited in 18 years of teaching.

Gerald Fetter
High School Teacher

JSC Education Highlights

JSC's Office of Education provided a host of unique educational activities for K-16 students and educators during 2012. The center's education specialists used STEM content from space exploration to inspire future explorers. The best and brightest moments of the year are highlighted below.

Texas High School Aerospace Scholars (HAS), one of JSC's premier education projects, began in 1999 as a partnership with the State of Texas to increase the number of students pursuing STEM degrees in Texas.

NASA Aerospace Scholars (NAS) emerged as a result of HAS' success to offer unique hands-on learning opportunities in STEM for high school students as well as community college students and educators in Texas, and replication sites across the U.S. In 2012, NAS implemented enhancements which included streamlined modules and increased online curricula interactivity by 50%; introduced student developed Podcasts to showcase their experiences and additional program efficiencies which resulted in a JSC Innovator Group Award. NAS has included 15,780 participants with over 10,200 being Texas Aerospace Scholars.



Women in STEM High School Aerospace Scholars (WISH) provided 134 female high school juniors, an almost 100% increase from the pilot year, from across the U.S. with an immersion of STEM learning through an interactive online community and summer experience. Students completed lessons covering past, current and future space exploration and enhanced their learning through chat sessions with NASA subject matter experts. Upon completing the lessons, students submitted individual final projects highlighting a leading female STEM professional who is developing cutting-edge technology or performing new research. Students competed to attend the summer event at JSC where they worked alongside female NASA engineers and interns to complete a project.

Space Lab Challenge is a partnership and collaboration with NASA, Google, YouTube, BioServe, and Space Adventures, where in 2012 more than 8,500 high school students from 80 countries designed experiments to be conducted in microgravity. The International Space Station (ISS) National Lab Education and Teaching From Space Offices represented NASA throughout the various challenge phases and worked with the ISS to facilitate on orbit taping of the winning experiments by the astronauts. The challenge culminated in a live chat between astronaut Sunita Williams onboard the ISS and student designers of the winning experiments. The YouTube Space Lab channel that hosted the 2012 competition had more than 51 million video views.

Science Off the Sphere is a Teaching From Space Project activity and partnership with the American Physical Society (APS) in which Astronaut Don Pettit examined how microgravity affects scientific principles. This video series featured unique physics experiments performed on the ISS using everyday objects. The video episodes were posted on the APS website and generated more than one million views in 2012.

National Air and Space Museum In-flight Education Downlink allowed students involved in the Student Spaceflight Experiments Program (SSEP) to speak live with astronauts Kevin Ford and Sunita Williams onboard the ISS. SSEP is an on-orbit educational research opportunity for students to design and send experiments to the ISS through a partnership with NanoRacks, LLC. The downlink was provided by the Teaching From Space Office and was hosted at National Air and Space Museum in Washington, DC. The downlink took place during International Education Week (IEW), a joint initiative between the U.S. Departments of State and Education to celebrate the benefits of international education and exchange.



I believe this experience will make me a better teacher and provide my students with new experiences and excitement for learning more about engineering, science, math and technology. Going into microgravity has been a life-long dream. This experience has allowed me to take science instruction to a new level.

Kaye Ebelt, Missoula, Montana—*Target Range School District*



The Reduced Gravity Education Flight Program (RGEFP)

worked with other NASA programs and government agencies to offer students and educators unique research opportunities in microgravity to new participants comprising 70 different teams. These partnerships included:

- The traditional reduced gravity flight program consisting of teams of undergraduate science and engineering students nationwide who proposed, designed, and flew a reduced gravity experiment. The 2012 flights included participants from 20 states and represented 25 different institutions. Eighteen proposals were selected for the 2012 flight year, including nine projects focused on engineering

concepts, seven on physical science experiments, and two on life science (including biology) experiments.



- The Teaching From Space Microgravity eXperience (MicroGX), a 6-month opportunity allowed high school educators and students to propose, design, fabricate, fly and evaluate an experiment for the reduced gravity environment. Educators and students shared their experiences and research in a series of interactive web seminars pre, during, and post flight week. Seven teams participated, representing 6 states and engaged more than 4,000 students from across the U.S.
- The Systems Engineering Education Discovery (SEED) project offered a nationwide solicitation of student applications aimed at addressing systems engineering challenges within both

microgravity and lunar gravity environments. Unlike the traditional reduced gravity flight program, the NASA technical workforce identified ongoing systems engineering and reduced gravity related projects. Selected student groups were paired with NASA research projects under a NASA Principle Investigator to carry out scientific research, hands-on investigational design, test operations, and educational/public outreach activities. The 2012 flights included participants from 8 states and 10 different institutions. Twenty-three projects were submitted from NASA Ames Research Center, Glenn Research Center, Jet Propulsion Laboratory, Johnson Space Center, Kennedy Space Center and Marshall Space Flight Center. Ten proposals were selected for the 2012 flight year.

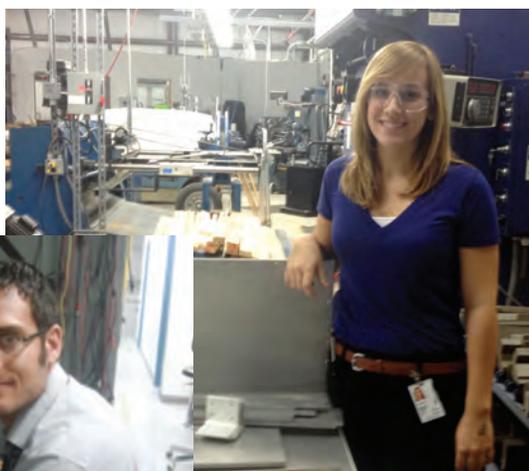
- The High Schools United with NASA to Create Hardware (HUNCH) project provided work experiences to inspire high school career technology and engineering academy students to pursue careers in science and engineering fields. HUNCH is a collaborative effort among NASA Space Operations and Exploration Systems mission directorates and Marshall Space Flight Center's Academic Affairs, Training and Crew Operations, and Ares Project offices. Students engaged in work-world experiences including the design, fabrication and rapid prototyping of multiple products for use in spaceflight. Eight teams representing five states were selected for this opportunity.
- Teaming with NASA Explorer Schools (NES), schools built and evaluated experiments that educators later performed during flight. The 2012 flights came from all over the United States, with 84 participants from 10 states representing 14 different institutions.

JSC Education Highlights (continued)

The Student Employment Program Office worked with various funding sources and organizations throughout the Center and Agency to maximize the number of student internship opportunities. A few highlights included:

- A federal partnership between NASA and the Air Force Research Laboratory in Albuquerque, NM secured JSC's management of a \$1.3M internship program, where 127 students participated.
- The Undergraduate Student Research Project (USRP), generated new internship opportunities and provided 80 students with hands-on experiences at NASA centers, despite major budget reductions.

The 18th Annual Space Exploration Educator's Conference attracted more than 500 educators from across the United States, Canada, Japan and the United Kingdom. The conference was held at Space Center Houston and included sessions by astronauts, engineers, scientists and education specialists. Educators attended professional development sessions on topics such as space suits, lunar certification training, and robotics. Several activities provided educators 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.



“
Being an intern at NASA has been an experience I will never forget. From driving the space exploration machine to developing protocols and experiments that will be used over the next twenty years, I will always hold this memory and opportunity close to my heart.

Deidra Huff, NASA Intern
Jarvis Christian College

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The JSC Digital Learning Network (DLN) completed a total of 809 live connections and reached a total of 35,687 participants. New technology and capabilities were implemented in 2012, including a JSC DLN developed mobile video-conference cart to provide live programming outside the studio in astronaut training facilities and off campus locations. The JSC DLN utilized new forms of web-conferencing such as Skype, ConferenceMe and Vidyo to connect to schools that do not have the costly standards based video conference systems.

International Space Station National Lab Education (ISS NLE) awarded five universities \$863,000 from the ISS NLE Project to conduct in-flight and ground-based experiments. The university-level opportunities further STEM education and enable employment in a STEM related career field.

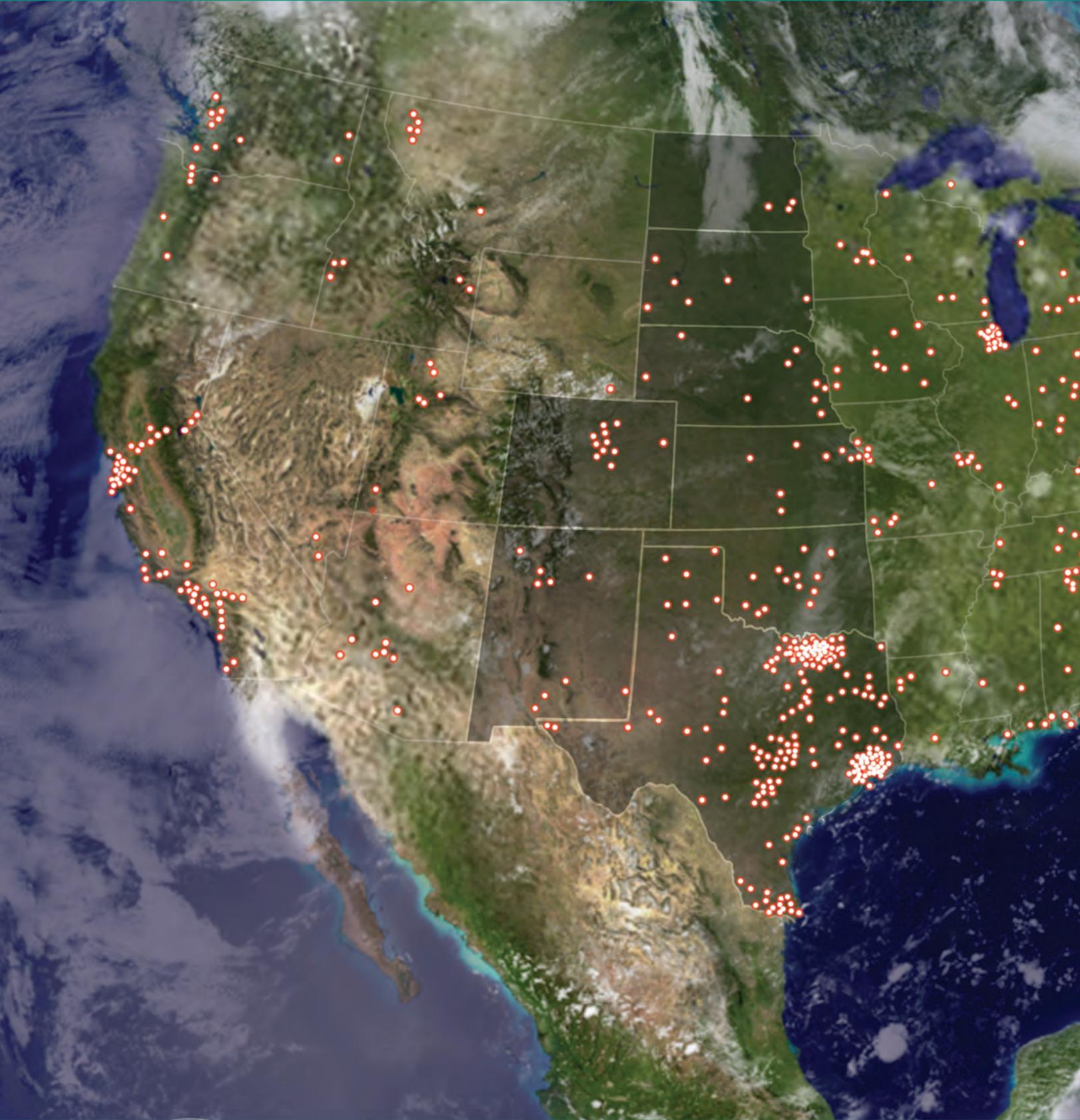
Mission X 2012 Challenge: Train Like an Astronaut Challenge was developed to encourage proper early childhood exercise and nutrition by teaching young people to live and eat like space explorers. The world-wide challenge hosted 9,846 children from 286 teams, 15 countries and 11 space agencies, and featured one mission dedicated to assisting youth on a global scale to live healthier lifestyles and learn about human space exploration. The MX12 website incorporated 13 languages.



Minority University Research and Education Program (MUREP) collaborated with many organizations to engage underrepresented and underserved faculty and students in NASA research and STEM education projects.

- The NASA Nebraska Pilot Career Exploration Workshop (NPCEW) collaboration between Space Grant, MUREP and NCAS brought 7 students to JSC for a 3-day pilot project. Funded by the Nebraska Space Grant, students planned a Mission to Mars, shadowed mentors and visited JSC facilities. The goal of this project was to expose students to NASA, inform them of current NASA-related activities, and increase students' interest in STEM. The pilot will serve as a model to replicate this project in different states with support from additional Space Grants, community colleges and Minority Serving Institutions.
- The JSC MUREP office served as the lead Center to coordinate the Agency's participation at the Society of Women Engineers (SWE) annual conference. A diverse group of women leaders from the Agency participated in a panel discussion and offered perspectives related to opportunities and challenges facing women in STEM careers. Center Director Dr. Ellen Ochoa served as a keynote speaker at the conference.
- Five JSC Pre-service Teacher Institute (PSTI) alumni were selected to represent the PSTI Alumni Flight Team—a pilot project with the RGFEP. The teammates were selected through a competitive process which included a proposal for lesson plans based on micro-gravity concepts. The team participated in interviews with their local media, created a website, YouTube page and individual blogs along with a Facebook page to inform the public of their venture and research. They successfully flew their two experiments in a microgravity environment and performed post-flight activities which included outreach in their communities and schools.

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 2012. The impact created on a local, state, regional, and national level is visible.



ALASKA



HAWAII

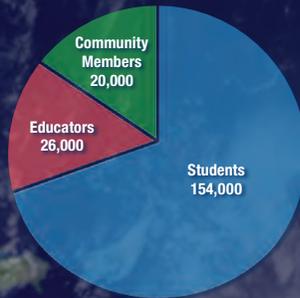


PUERTO RICO



US VIRGIN ISLANDS

Reached over 27 million individuals virtually including every US state/territory and 120 foreign countries



JSC's Education Office involved over 200,000 individuals through a variety of activities in 2012

JSC Education Partnerships

JSC's Office of Education continues to strengthen interest in STEM by leveraging the excitement of human space exploration. Through 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:



Strategic Business Collaboration

- LEGO
- Lockheed Martin
- YouTube/Google/Space Adventures/BioServe

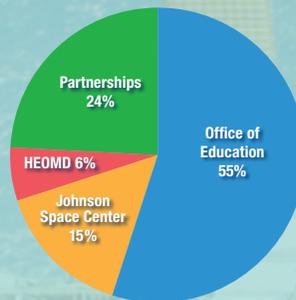
Intergovernmental Agreements

- Air Force Research Laboratory
- State of Texas
- United States Coast Guard
- United States Department of Education
- United States Department of Energy

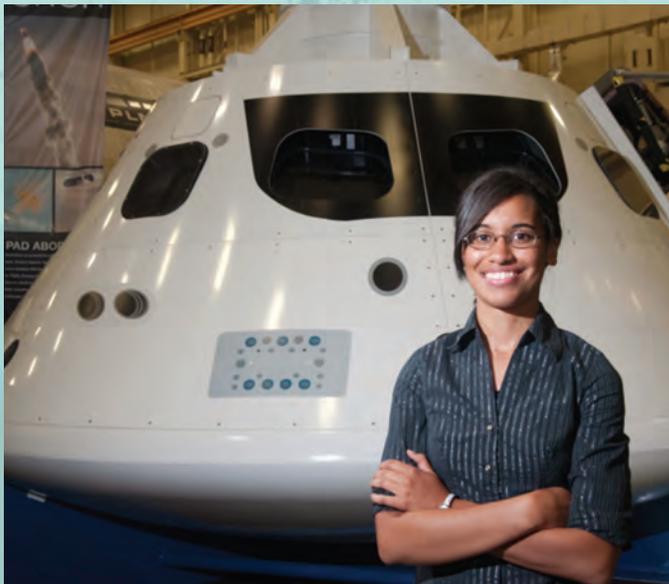
Over 3 million
webpage views

Over 51 million
video views

Over 12,000 students
participated in ISS
in-flight downlink



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



University Collaboration

- North Carolina A&T State University
- Oklahoma State University
- Prairie View A&M University
- Purdue University
- San Jacinto College Aerospace Academy
- Texas A&M University
- University of Houston System
- University of Southern Mississippi
- University of Texas at El Paso
- University of Texas Pan American

Over 1 million video views

Non-profits and Associations

- American Physical Society
- Clear Creek Independent School District
- Houston Livestock Show and Rodeo
- National Air and Space Museum
- National Association of African American Studies and Affiliates
- National Federation of the Blind
- National Institute of Aerospace
- National Science Teachers Association
- Public Broadcasting System
- Rotary National Award for Space Achievement Foundation
- Sally Ride Science
- Sesame Street
- Society of Women Engineers
- Space Center Houston
- Universities Space Research Association

Aired NASA content on 4 episodes reaching 120 countries

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, entire country, and many nations around the world. 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.

STEM Engagement (SE)

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.

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

Education Strategic Partnerships: JSC strives to strategically partner with formal and informal organizations which offer unique resources and capabilities aimed at achieving NASA education goals and outcomes.

Flight Projects' student components: A national K-12 project facilitates and funds opportunities for students that utilize NASA unique content, facilities, and people.

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 experience as inspiration to increase the number of high school students entering STEM degrees and careers.

Interdisciplinary National Science Program Incorporating Research Education Experiences (INSPIRE): 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. Summer of Innovation (SOI): 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.

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.

Reduced Gravity Education Flight Program (RGEFP): 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.

STEM Conference Support: JSC supports various conferences aimed at increasing interest in in STEM.. Conferences include Hispanic Engineering, Science, and Technology Week (HESTEC) and Great Minds in STEM, and Society of Women Engineers (SWE).

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

NASA Internships, Fellowships, and Scholarships (NIFS)

Air Force Research Laboratory (AFRL): JSC collaborates with AFRL to provide additional STEM internship opportunities at Kirtland Air Force Base in Albuquerque, NM.

Career Exploration Program (CEP): 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 Project (GSRP): An agency-wide fellowship program for graduate study leading to masters or doctoral degrees in a STEM field, related to NASA research and development.

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

Texas Aerospace Scholars Interns: Attracts outstanding students to an internship opportunity at JSC. Eligible students for the internship must be 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.

Undergraduate Student Research Project (USRP): 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.

Institutional Engagement (IE)

Experimental Program to Stimulate Competitive Research (EPSCoR): Establishes partnerships with government, higher education and industry that are designed to effect lasting improvements in a state's or region's research infrastructure, R&D capacity and hence, its national R&D competitiveness. In addition to the research and technology development, the awards enable faculty development and higher education student support.

Informal Institutions: 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.

NASA Science and Technology Institute (NSTI): The institute gives students and researchers the opportunity to collaborate with government, the private sector, other majority institutions, and research and technical organizations through the establishment of research and development collaborations and partnerships.

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

Steckler Project: 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.

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.

Educator Professional Development (EPD)

Aerospace Education Services Project (AESP): 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.

Digital Learning Network (DLN): Provides interactive educator professional development via videoconferencing and webcasts on NASA unique STEM content.

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

Face-to-Face Institutes (F2F): F2F offers interaction activities at JSC. Each activity includes a tie to JSC facilities, personnel, missions, and an in-class lab/experiment component for educators.

Flight Projects' educator components: A national K-12 project facilitates and funds opportunities for educators that utilize NASA unique content, facilities, and people.

Middle School Aerospace Scholars (MAS): MAS gives teams of middle school educators from across the state of Texas an opportunity to participate in a unique professional development project. Educators spend one week during the summer at JSC learning to integrate NASA resources into their own curriculum.

NASA Explorer Schools (NES): 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.

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

Summer of Innovation (SOI): Supports student interest in STEM strengthening the capacity of community- and school-based organizations by providing educator professional development during the summer.



I think what you did was really fun and interesting. It was a great learning experience and it changed my mind about my dreams. I feel like I can do anything I want to be, no matter what tries to stop me.

Amanda, Johnston Middle School Student, TX

For more information, visit:

<http://education.jsc.nasa.gov>

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