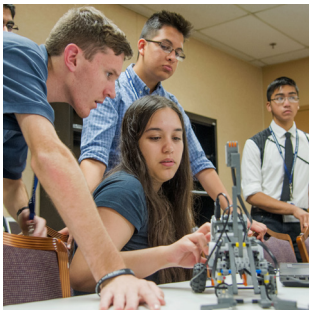
National Aeronautics and Space Administration

2013 Johnson Space Center Education Annual Report



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Director's Letter

I'm pleased to share Johnson Space Center's (JSC) 2013 Education Highlights.

Across the nation, the conversation about our country's future continues to focus on the importance of science, technology, engineering, and mathematics (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.

NASA's ability to inspire future generations requires a renewed commitment to innovation, adaptability, and a clear focus on our goals. Through our Office of Education, we can open the doors of JSC-unique facilities and share JSC's engineering and science expertise. Our 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 internships. We continue to enhance our portfolio and expand our partnerships to serve the greatest number of participants.

In 2013, JSC's Office of Education took the lead on internships for the Agency, launched the Exploration Design Challenge providing over 112,000 students the opportunity to tackle one of the major challenges of long duration exploration – space radiation, conducted the first Spanish language Digital Learning Network connections to bilingual classrooms, and many more accomplishments you may read about in the following pages.

It is a tremendous honor for me to represent the talented team at JSC, and I'm looking forward to a great 2014. Find out how you can stay up to date on NASA programs throughout the year on social media at www.nasa.gov/connect.

Get the students, educators, and community members around you involved by sharing JSC Education opportunities with them. You can find more information about JSC Education's activities at http://education.jsc.nasa.gov.

Sincerely,

Ellen Ochoa

Ellen Ochoa
Director, Johnson Space Center

NASA Education

NASA's Johnson Space Center (JSC) in Houston strives to improve Science, Technology, Engineering, and Mathematics (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 experiential activities for students and educators, sharing classroom resources, and collaborating with educational partners.

NASA's JSC Office of Education continues to participate in the Administration's Committee on STEM Education (CoSTEM). Through that committee, we work closely with all relevant stakeholders as plans are created and unfold in support of the STEM coordination efforts across Federal agencies. This venue allows us to share our best practices and ensure the committee is aware of the inspiring and unique content, assets, and programming that NASA Education can share via partnerships with other institutions and agencies.

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 activities for our nation's educators and students.

NASA continues to pursue four major education goals:

- Growing NASA and the Nation's STEM workforce
- Developing STEM educators
- Engaging and establishing partnerships with institutions
- Inspiring and educating the public

NASA Education Framework

Johnson Space Center continues to lead and implement activities within the Agency's four key Lines of Business. JSC focuses our education investments to ensure they are NASA unique and non-duplicative of other Federal Agencies involved in STEM education. JSC Education personnel serve as agency experts and coordinators in providing intellectual leadership and focus on NASA Education's four key lines of business: NASA Internships, Fellowships, and Scholarships; STEM Engagement; Institutional Engagement; and Educator Professional Development.

NIFS

NASA Internships, Fellowships, and Scholarships (NIFS)

The JSC Office of Education supports the Agency's NASA Internships, Fellowships, and Scholarships line of business - which offers students exposure to NASA through STEM-based professional activities that contribute directly to the execution of independent research or mentored hands-on experiences. This leverages NASA's unique mission activities to enhance and increase the capabilities, diversity, and size of the nation's next generation workforce needed to enable future NASA discoveries.

STEM Engagement (SE)

The JSC Office of Education supports the Agency's Science Technology Engineering Mathematics (STEM) Engagement (SE) Line of Business by offering exceptional opportunities to reach educators, faculty, and students, both inside and outside formal K-16 education. The SE model effectively facilitates the execution of public education events, experiential learning opportunities, and STEM challenges to engage the public in NASA's missions while placing appropriate emphasis on meeting national needs. SE activities are designed to increase learners' interest and involvement in STEM, improve their ability to participate in STEM studies and careers, and enhance their understanding of the value of STEM in their lives.

SE

IE

Institutional Engagement (IE)

The JSC Office of Education supports the Agency's Institutional Engagement (IE) line of business which enables STEM institutions and organizations to strengthen their capacity to perform STEM research and development aligned with NASA, to enhance their curriculum and programming, and deliver content based in NASA's mission. IE also includes collaboration with those organizations that enable others to accomplish STEM and develop an interest in STEM. Institutions and organizations that fit in the IE model cover a diverse spectrum of both formal and informal education entities.

EPD

Educator Professional Development (EPD)

The JSC Office of Education supports the Agency's Educator Professional Development (EPD) line of business by offering professional development to K-12 and pre-service educators. The EPD integrates NASA missions, education resources and NASA unique facilities to provide high quality STEM content and hands-on learning experiences. EPD includes Face-to-Face Institutes, Partner-Delivered Face-to-Face, Online EPD, and Community-Requested EPD. Educators return to their classrooms equipped with real-world experiences relevant to NASA content, hands-on training from NASA EPD specialists and readiness to teach and engage their students in the STEM areas.

JSC Education Highlights

JSC's Office of Education provided a host of unique educational activities for K-16 students and educators during 2013. 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.

Internships: After a successful 19 years, the Career Exploration Program (CEP) wrapped up operations as NASA Internships transitioned into a streamlined, Agency-wide management process. Since it began in 1994, CEP has hosted more than 1,300 students from 39 different high schools and 59 different colleges. CEP interns have contributed to missions at JSC in 150 different organizations with the help of more than 500 mentors. Female students comprised 65%, and minority students comprised 60% of all CEP interns.

After 13 years, the Undergraduate Student Research Project (USRP) was also sunset. This Agency-wide internship activity generated over 2,400 internship experiences from 2000-2013. JSC was the implementing center for this activity from 2007 to 2013. Under JSC's leadership, USRP expanded from an average of 120 to over 300 internships per year and became a truly year-round program, generating 972 semester internships.

In 2013 JSC Office of Education continued to lead the Agency's headquarters-funded internship efforts during a transitional period, employing the Undergraduate Student Research Project (USRP) to place 270 students in NASA internships at all 10 NASA centers across the country. In 2014, the new NASA Internships activity will consolidate the majority of internships Agency-wide under a single set of processes. The JSC Office of Education will lead implementation of these internship activities across the Agency with NASA's Internship Operations Manager residing here at JSC. In preparation for the initial roll-out of NASA Internships for the Fall 2013 session, a cooperative agreement was awarded to University Space Research Association (USRA) to facilitate internship experiences. USRA will provide a wide range of support to all NASA centers including stipends, data entry, reporting, and on-site coordination.

Under the new NASA Internships processes, the JSC Office of Education will continue to partner with organizations across the center to fund internships specific to their needs. Funding internships allows organizations to play a more active role in the intern selection process, increase the number of internship opportunities for students, and assure their needs are met.

This program allows for educators to update their knowledge of the latest NASA projects and current objectives. Teaming up with NASA allows our students to have a direct pipeline to sources that have played an historic role in space exploration. We look forward to future endeavors.

Connie Richardson Smith — *Sioux City Public Museum*

Exploration Design Challenge: The Teaching From Space Office collaborated with Lockheed Martin and the National Institute of Aerospace to develop and launch the Exploration Design Challenge (EDC) – a premier NASA Education STEM engagement activity that ties to Exploration Flight Test 1 (EFT-1) of the Orion spacecraft. The EDC challenges K-12 students around the world to think like scientists to overcome one of the major hurdles for deep space, long-duration space flight – protecting astronauts and hardware from the dangers of space radiation.

Student participants will have their names flown on Orion's Exploration Flight Test 1 and one high school team will fly their design. To date, over 112,000 students are participating in the challenge and more are registering each day.

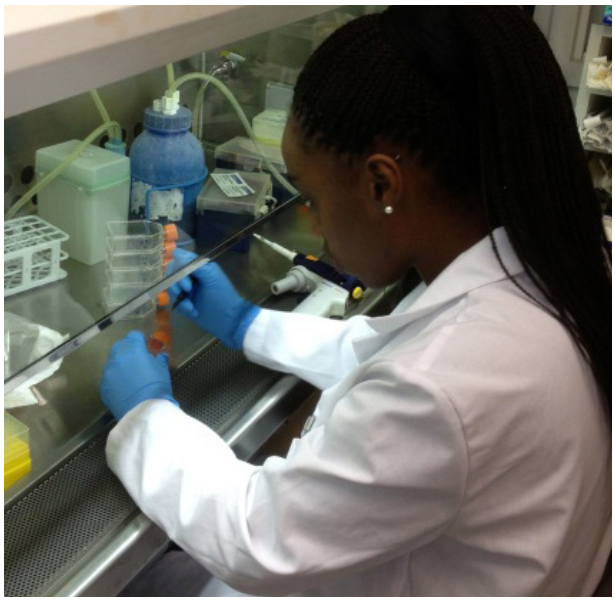
Sally Ride EarthKAM: Sally Ride Earth Knowledge Acquired by Middle School Students, or EarthKAM, experienced a 576% increase in student participation during 2013. The Teaching From Space Office teamed with JSC's Public Affairs Office and activity partner Sally Ride Science to design and implement a revitalized promotion campaign. As a result, over 166,000 students in 63 countries conducted hands-on research as they programmed a camera onboard the International Space Station to take pictures of specific locations on Earth. In 2013, the activity was renamed Sally Ride EarthKAM to honor the late Dr. Ride.

In-flight Education Downlinks: Live In-flight Education Downlinks are similar to video conferences and provide US students and educators with an opportunity to have real time interface with International Space Station crewmembers as they orbit the Earth. In 2013, the Teaching From Space Office and the Public Affairs Office teamed-up to facilitate 15 downlinks that reached over 1400 educators and over 36,000 students in 12 states.

One of the downlinks, held at Fredericksburg High School in Fredericksburg, TX was attended by Congressman Lamar Smith (R-TX), the Chair of the House Committee on Space, Science, and Technology. Congressman Smith made the opening remarks to the ISS crew and over 1,000 students and educators were in the audience to join students from the school's Science, Technology, Engineering, and Math program as they asked astronaut Chris Cassidy questions about living and working in space.

University Research-1 (UR-1): University Research-1 (UR-1) is a first generation program, designed to engage Tier 2 and Tier 3 education institutions that have a previously established relationship with NASA. UR-1is sponsored by the International Space Station

JSC Education Highlights (continued)



University Research Program in partnership with the JSC Human Health and Performance Directorate to extend the original ground-based science conducted by a Minority University Research and Education Program (MUREP), NASA Science and Technology Institute- Minority Institution (NSTI-MI) and the United Negro College Fund Special Programs (UNCF SP) to microgravity research aboard the International Space Station. The five universities in the research cluster are Texas Southern University, Prairie View A&M University, Tougaloo College, Jarvis Christian College, and Savannah State University. Their experiment will fly on SpaceX 3 in early 2014.

WaterBots: WaterBots offers students ages 12-16 an opportunity to build and test underwater robots at JSC's Neutral Buoyancy Laboratory. Beginner and intermediate summer camps are offered based on the student's experience with electronics, soldering and robot construction. The summer camps also feature tours at JSC, professional speakers, and access to JSC-unique facilities. In 2013, 132 students participated, four times the number of participants in 2012. Economically disadvantaged students were awarded scholarships through partnerships with Kroger Foundation, Pasadena ISD, and V.W. Miller Intermediate School. WaterBots is facilitated by Aerospace Academy through a Space Act Agreement with the JSC Office of Education.

Robotics Ocean Microgravity Explorers (ROME): The first ever Robotics Ocean Microgravity Explorers (ROME) Challenge was hosted in May 2013 at the Neutral Buoyancy Laboratory. ROME allows middle school students to develop an understanding of microgravity conditions on the International Space Station by getting hands-on experience with underwater robotic technology at a JSC-unique facility thanks to collaboration between the JSC Office of Education and San Jacinto College's Aerospace Academy. There were 600 middle school students directly or indirectly impacted by this program, and it involved 28 educators from 19 different school districts across Texas, Nebraska, and Iowa.

Reduced Gravity: To date, student teams from all 50 states have flown. These include 3,646 undergraduate students from 206 universities. In 2013, more than 150 undergraduate students and faculty 112 K-12 students and educators flew on a reduced gravity flight facilitated by the JSC Office of Education. Activities with a reduced gravity flight component include the Reduced Gravity Undergraduate Student Flight Opportunities, the Minority University Research and Education Program (MUREP), the System Engineering Educational Discovery (SEED) program for undergraduates, the High Schools United with NASA to Create Hardware (HUNCH) program, Microgravity eXperience, and the NASA Explorer Schools.

Digital Learning Network: The JSC Digital Learning Network (DLN) completed a total of 668 live connections and reached a total of 27,800 participants in 45 states and the District of Columbia. Technology and innovation were

maximized to showcase the International Space Station Mission Control Center, Neutral Buoyancy Laboratory, and Space Vehicle Mock-up Facility through live educational events. New collaborations were established with Sally Ride EarthKAM and the Environmental Protection Agency as well as hosting and producing an ISS Crew Choice Downlink with Commander Chris Hadfield featuring "Music in Space." In 2013 the DLN also conducted Spanish language connections with bilingual classrooms for the first time.

HUNCH Collaboration: NASA's High School Students United with NASA to Create Hardware (HUNCH) program partnered with Madison High School (Houston Independent School District) and

Clear Lake High School (Clear Creek Independent School District) this year in the production of Space Shuttle sleep restraint replicas. 26 students participated in the design, pattern development and fabrication of 12 adult-sized sleep restraints and five child-sized sleep restraints. This activity provided students with high-fidelity, real-world fabrication and critical thinking skills. These sleep restraints will help JSC engage and educate teachers, students and the general public about living in space and highlight NASA's educational opportunities.

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:

Business Collaboration

Galena Park ISD

Galveston ISD

Girlstart

Houston Livestock Show and Rodeo

Lockheed Martin

McKinney ISD

National Association of African American Studies and Affiliates

National Institute of Aerospace

National Science Teachers Association

Governmental Agreements

19th Annual Space Exploration Educators Conference (SEEC) with Space Center Houston

Barbers Hill Middle School

Clear Creek ISD

Crenshaw School Summer Camp

D.R.E.M.E. Foundation

Eastern Kentucky University

Environmental Protection Agency

Non-profits & Associations

SpaceX
State of Texas
STEM Youth Academy
Texas A&M University
Texas Southern University
Texas Space Grant Consortium
University of Houston
University of Texas at El Paso
University Space Research Association

New Mexico State University
North Carolina Museum of Natural Sciences
Oklahoma State University
Prairie View A&M University
Rotary National Award for Space Achievement Foundation
Sally Ride Science
San Jacinto Community College
Society of Women Engineers

School Collaboration

JSC Education Activities

JSC Education strives to reach students, educators and the general public through a variety of activities. These activities stretch beyond Texas to impact students and educators in every state and many other countries around the world and 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 activity managed or operated through JSC Education.

STEM Engagement (SE)

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

Digital Learning Network: 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 to offer unique resources and capabilities aimed at achieving NASA education goals and outcomes.

High School Aerospace Scholars: Partners JSC with multiple states, building on the success of Texas High School Aerospace Scholars 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.

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.

Women in STEM High School Aerospace Scholars (WISH): Provides an opportunity for girls to participate in in online activities and a 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.

Flight Projects for students: Facilitates and funds opportunities for students that utilize NASA unique content, facilities, and people.

NASA Internships, Fellowships, and Scholarships (NIFS)

NASA Internships: Consolidates the majority of internships Agency-wide under a single set of processes. The JSC Office of Education leads the implementation of these internship activities across the Agency with the NASA's Internship Operations Manager residing here at JSC.

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.

> **One of the best glimpses into the real STEM world that I have ever had. I have absolutely no doubt that my time here will have nothing but a positive impact on my future as a physicist, a scientist, and passionate learner.**
>
> High School Aerospace Scholars participant

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, research and development capacity and hence, its national 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): 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 Consortiums: Provides funds through Space Grant Consortiums across the U.S. for 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: Increases research content consistent with NASA's vision for aeronautics and space exploration among the nation's minority serving institutions through a competitive cooperative agreement.

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: Provides interactive educator professional development via videoconferencing and webcasts on NASA unique STEM content.

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

Flight Projects for educators: Facilitates and funds opportunities for educators that utilize NASA unique content, facilities, and people.

Middle School Aerospace Scholars (MAS): Gives teams of middle school educators from across the state of Texas an opportunity to participate in a unique professional development activity in conjunction with the Texas Space Grant Consortium's Liftoff program. Educators spend one week during the summer at JSC learning to integrate NASA resources into their own curriculum.

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: Provides educator professional development to strengthen the capacity of community education organizations to deliver STEM leraning for students.

2013 By The Numbers

Whether it's bringing students to Johnson Space Center or bringing the Internantional Space Station to students virtually, JSC Education activities reach far and wide. JSC strives to reach the most diverse and brightest minds across the country with its education efforts.

4 lines of business

K-16 students, educators, and community members.

40+ partnerships created.

Beyond U.S. states and territories, 65 foreign countries were reached.

More than 2,000 community members reached directly.

More than 8,000 educators involved.

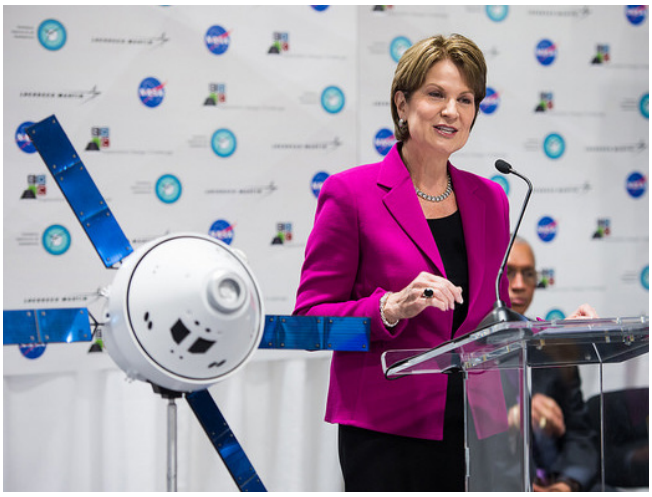
50,000+ social media fans

More than 350,000 students reached directly.

More than 27 million individuals reached virtually.

What's Next in 2014?

JSC Education's efforts in 2013 set up a strong foundation for success in future years. Many activities like Exploration Design Challenge and University Research-1 are advancing to the next stage, and new activities like Agricultural Community College Aerospace Scholars (AgCAS) are being designed using lessons learned from past activities. Here's a look at some of the exciting activities coming up in 2014.



Exploration Design Challenge (EDC): Orion's first exploration flight test (EFT-1) in late 2014 will bring the opportunity for the more than 112,000 students that participated in the EDC to become a virtual crewmember by having their names flown aboard the Orion vehicle. The team with the winning design will work with NASA and Lockheed Martin to get their experiment flight-ready for EFT-1.

University Research-1 (UR-1): The five universities in the UR-1 research cluster will get to fly their microgravity experiments to the International Space Station aboard SpaceX 3 in early 2014. The students will travel to Kennedy Space Center to prepare their experiments and watch the launch.

Agricultural Community College Aerospace Scholars (AgCAS): The Houston Livestock Show and Rodeo, NASA, Oklahoma State University, and Texas A&M University will collaborate to develop a space-based agriculture themed Community College Aerospace Scholars (CAS) activity. Students currently pursuing degrees, certificates, or other credentials in agriculture at Texas community, technical, and junior colleges will be eligible for participation. Students who are highly engaged and successful in the web-based component may be selected for an on-site experience at JSC and a recognition opportunity at the Houston Livestock Show and Rodeo.

JSC Internships: Efforts continue to consolidate internships under one process and work with organizations around the center and space grant consortia around the country to increase available funding for students to intern at JSC in 2014. There will be a 100% increase in mentor-funded interns and an 80% increase in space grant funded interns during Summer 2014.

For more information, visit:

http://education.jsc.nasa.gov

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