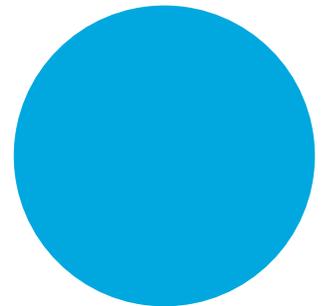
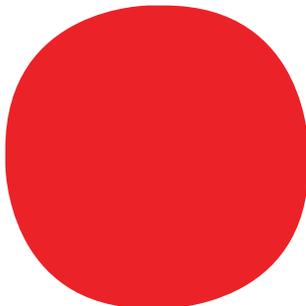
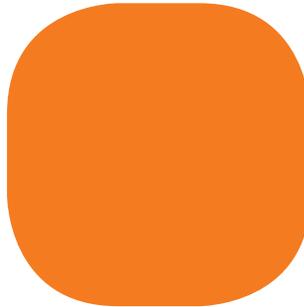
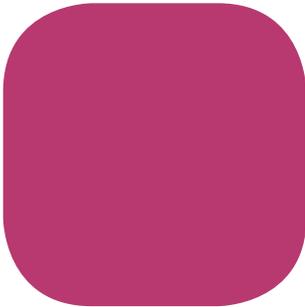
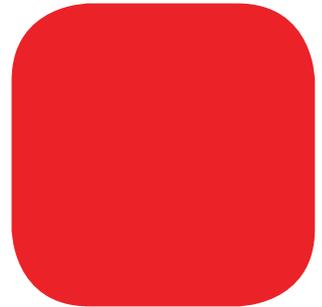
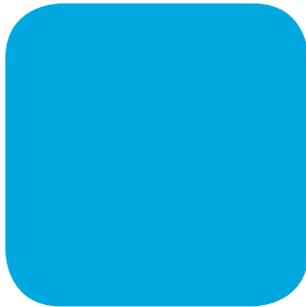




2014 Johnson Space Center Education Annual Report



Director's Letter



I'm pleased to share Johnson Space Center's (JSC) 2014 Education Highlights.

The future of our nation depends on educating students about the importance of science, technology, engineering, and mathematics (STEM). JSC's Office of Education engages learners of all ages to advance human space exploration by providing unique opportunities to discover and develop their full potential.

NASA's ability to inspire future generations requires a renewed commitment to innovation and adaptability. Through the Office of Education, JSC employees proudly share their knowledge and expertise with educators and students by offering NASA experiences, professional development, research, and internships. We develop new, innovative activities, streamline existing opportunities, and expand our partnerships with industry to help us serve an increasing number of participants.

In 2014, JSC's Office of Education completed the Exploration Design Challenge providing more than 183,000 students the opportunity to tackle one of the major challenges of long duration exploration – space radiation. The NASA Community College Aerospace Scholars program became a nationwide education opportunity, doubled the number of onsite workshops in 2014, and hosted 33% more students in workshops at Johnson Space Center, the Jet Propulsion Laboratory, and Marshall Space Flight Center for a cross-center collaboration. Futures were brightened as 130 interns from 83 universities and high schools worked with subject matter experts in various organizations throughout JSC. The Office of Education also completed University Research-1, a collaborative mission with minority-serving institutions to advance ground-based student cancer research to flight-based research aboard the International Space Station. Through a partnership with the Texas and Oklahoma 4H Councils, the Office of Education trained educators on Orion Exploration Flight Test-1 mission content for use during the National Youth Science Day, where thousands of youths throughout the country completed a "Rockets to the Rescue" project. There are many more accomplishments shared in the following pages. I hope you will take some time to read about them and share this information with others.

Find more information about JSC Education's activities at education.jsc.nasa.gov and stay up to date on NASA programs throughout the year on social media at www.nasa.gov/connect. It is a tremendous honor for me to represent the talented team at JSC, and I'm looking forward to a great 2015.

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

Johnson Space Center's Office of Education strives to improve STEM education, increase interest and encourage actions by educators and students to advance human space exploration. 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 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



The JSC Office of Education continues to participate in the National Science and Technology Councils 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 to 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 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.

SE

STEM Engagement (SE) provides opportunities for participatory and experiential learning activities in formal and informal settings to connect learners to NASA-unique resources. The SE model 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.

NASA Internships, Fellowships, and Scholarships (NIFS)

launch a new era of learning, innovation and achievement. NASA inspires students to pursue STEM careers by providing these internships, fellowships and scholarships to leverage unique mission activities and increase the capabilities, diversity, and size of the nation's next generation workforce needed to enable future NASA discoveries.

NIFS

EPD

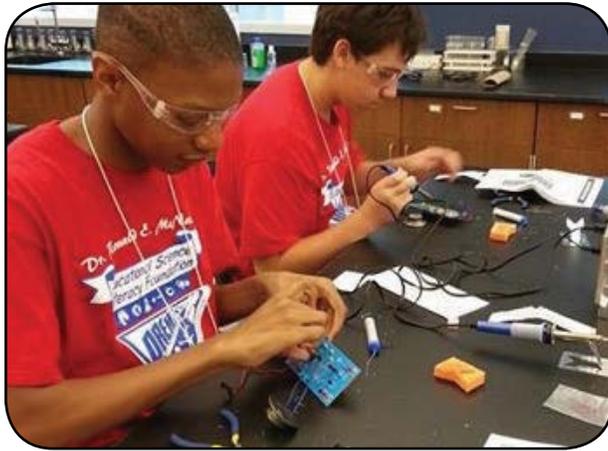
Educator Professional Development (EPD) offers professional development to K-12 and pre-service educators. EPD integrates NASA missions, education resources and NASA-unique facilities to provide high-quality STEM content and hands-on learning experiences. EPD includes Face-to-Face Institutes, Partner-Delivered Face-to-Face, Online EPD, and Community-Requested EPD. Educators return to their classrooms equipped with real-world experiences to teach and engage their students in STEM areas.

Institutional Engagement (IE)

enables formal and informal institutions to strengthen their capacity to perform STEM research and develop sustained STEM capabilities in topical areas of interest to NASA. IE focuses on competitive awards to sustain an institution's ability to deliver NASA content.

IE





STEM Engagement (SE)

Exploration Design Challenge: Students from around the world participate in Orion's first flight by completing an online radiation shielding activity.

High School Aerospace Scholars: High school juniors compete in an online session to earn a weeklong STEM-filled experience at NASA.

International Space Station (ISS) Education Downlinks: Students speak live with astronauts and cosmonauts onboard the ISS.

NASA Community College Aerospace Scholars: Community college students nationwide compete during an online session to earn a three-day experience at a NASA field center.

NASA Internships, Fellowships and Scholarships (NIFS)

JSC Internships and Fellowships: JSC hosts fellows sponsored by various organizations to support human spaceflight research.

Agency Internships: High school, undergraduate and graduate students take part in numerous hands-on, mentor-led, NASA-specific experiences.

NASA Science and Technology Institute for Minority Institutions: The talent and expertise of all minority institutions are combined through research-based fellowships, internships, co-ops and grants.

Educator Professional Development (EPD)

Digital Learning Network (DLN): NASA's DLN offers interactive, education standards-based videoconferencing to bring a unique, NASA-authentic experience to the classroom.

Educator Resource Center: (ERC) The ERC provides guidance to educators about NASA's teaching resources, educational programs, and interactive websites.

Lift-Off to Literacy: Teachers are challenged to engage students in 60 extra seconds of literacy activities for 60 days as part of this worldwide campaign sponsored by the International Reading Association.

Middle School Aerospace Scholars: Middle school educators in Texas participate in virtual and face-to-face EPD opportunities that align NASA's resources for the classroom to Texas Essential Knowledge and Skills (TEKS) standards.

NASA Educator Professional Development: Educators participate in free education webinar series that include training on activities, lesson plans, educator guides and NASA classroom resources.

Pre-Service Teacher Institute: Pre-Service teachers and faculty member teams participate in an online and face-to-face institute highlighting education resources on human spaceflight, evidence-based teaching practices, and JSC assets.

Space Exploration Educators Conference: NASA provides presentations on ongoing missions, subject matter experts, exhibitions, and promotion to this annual conference at Space Center Houston.

Summer of Innovation: Informal educators and middle school students collaborate with NASA to support the 4-H National Youth Science Day activities.

Institutional Engagement (IE)

Informal Institutions: JSC partners with museums, science centers and informal education groups to promote STEM literacy and awareness.

Reduced Gravity Education Flight Program: Student research teams submit proposals to design, build and test an experiment aboard NASA's reduced gravity aircraft.

Steckler Project: JSC provides research activities that address innovative, meaningful and enduring research and technology development that could enable space colonization or space settlement.

University Research-1: ISS collaborates with five Historically Black Colleges and Universities (HBCUs) and the NanoRacks commercial platform to advance ground-based student cancer research to flight-based research aboard the ISS.

University Research Centers: This project is designed to achieve a competitive aerospace research capability among the nation's minority institutions.



JSC Education Highlights

JSC's Office of Education provided a host of unique educational activities for K-16 students and educators during 2014. 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 in the following pages.

University Research-1 (UR-1): A first generation program designed to engage Tier 2 and Tier 3 education institutions that have a previously established relationship with NASA. UR-1 is sponsored by the International Space Station University Research Program in partnership with the JSC Human Health and Performance Directorate. UR-1 extended the original ground-based science conducted by the Minority University Research and Education Program (MUREP), the NASA Science and Technology Institute-Minority Institution (NSTI-MI) and the United Negro College Fund Special Programs (UNCF SP) to microgravity research aboard ISS. 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. On April 18, 2014, the team of professors and students successfully launched research to the ISS on SpaceX 3.



Internships: The majority of NASA internships were consolidated under a single set of processes in 2014. The JSC Office of Education led the implementation of these internship activities across the agency with NASA's internship operations manager residing at JSC. A cooperative agreement was awarded to University Space Research Association (USRA) to facilitate internship experiences and provide a wide range of support to all NASA centers, including stipend disbursement, data entry, reporting, and onsite coordination.



Under the new NASA internship processes, a total of 720 internships were managed across all NASA centers in 2014. The JSC Office of Education continues to partner with organizations across the centers 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 ensure the organization's requirements are met. In 2014, mentors and technical organizations at six NASA centers funded a total of 414 internships. At JSC, 130 interns from 83 universities and high schools were placed in various organizations in FY14. Of these, 72 were mentor funded.

The Exploration Design Challenge (EDC):

The Exploration Design Challenge asked students to research and design ways to protect astronauts from space radiation. NASA and Lockheed Martin built the Orion spacecraft to carry astronauts beyond low-Earth orbit and on to an asteroid or Mars. Protecting astronauts from radiation on these distant travels is an important – and very real – problem that needs solving.

More than 183,500 students and 25,600 educators from 95 countries around the world stepped up to the challenge and participated in Orion's first flight, Exploration Flight Test-1, by completing an online radiation shielding activity. Students who completed the activity had their name flown on-board Orion during the mission.



High school students could take the challenge a step further and design a radiation shield payload that would fly aboard Orion. After a yearlong competition among high school teams across the country, evaluators from NASA, Lockheed Martin and the National Institute of Aerospace selected Team ARES, from the Governor's School for Science and Technology in Hampton, Va., as the winner.



On December 5, 2014, Orion blasted off carrying Team ARES' winning radiation shield design alongside the name of all the students and educators who completed the challenge. Team ARES designed the radiation shield payload, a cube-like design comprised of different metal layers and a polyethylene core. The design carried several radiation-sensing devices, called dosimeters, which provided information on how well the design performed during the flight. On this mission, Orion flew through the Van Allen Belt, a dense radiation field that surrounds the Earth in a protective shell of electrically charged ions. Understanding and mitigating radiation exposure during Orion's flight test can help scientists develop protective solutions before the first crewed mission.

Following the flight, the dosimeters were sent to Oklahoma State University for analysis, and the results were returned to the students. The students are currently working on turning the results into a research article that will be submitted to scientific journals. Team ARES was in Florida to witness the launch of their payload, known as the Tesseract, which was the only education experiment aboard Orion's first flight.

JSC Education Highlights (continued)

NASA Community College Aerospace Scholars (NCAS):

In an era when educational leaders are challenged to respond to the President's call to retain diverse STEM students in 2- and 4-year degrees, NCAS leads the way. The program began as Community College Aerospace Scholars in 2004, serving Texas community colleges. A nationwide version of the program, National Community College Aerospace Scholars, began in 2009. 2014 marked the merger of the two programs into NCAS, funded by MUREP and the state of Texas. This merger increased efficiency across resources and infrastructure to allow NCAS to broaden its impact.

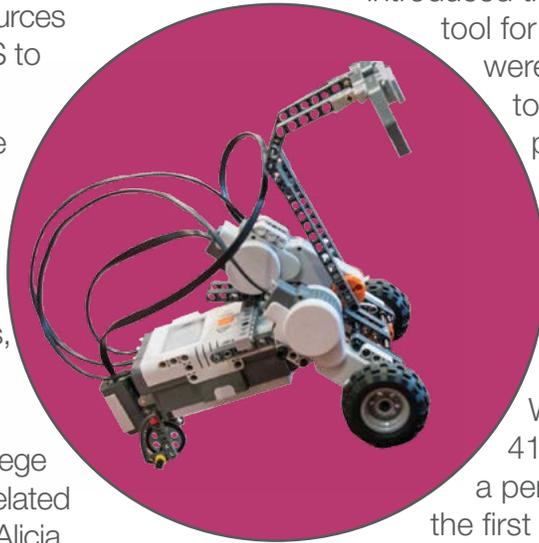
In 2014, NASA's Johnson Space Center, the Jet Propulsion Laboratory and Marshall Space Flight Center hosted 235 students from 155 community colleges in six NCAS workshops, an increase of 78% from 2013.

"We are excited to expand opportunities for community college students interested in a NASA-related career," said Program Manager Alicia Baturoni-Cortez. "NCAS is a direct response to the President's call to enhance the STEM experience of undergraduate students." Scholars leave the workshops with the motivation, skills, and resources they need to take the next step to a career at NASA.

NASA High School Aerospace Scholars (HAS):

Celebrating its 15th anniversary, HAS engaged 554 Texas high school juniors in a six-month online course and culminated events by hosting 256 students at JSC throughout the summer of 2014. Since 1999, 3,815 Texas students have spent six days of their summer at JSC attending the HAS onsite experience.

In addition to building rovers and landers and planning a mission to Mars, a new activity was introduced this year. Students designed a tool for use on the space station, and were able to see their design come to life through the use of a 3D printer. This intersected well with real-time events on the space station, as the first 3D printer in space was scheduled to launch on an upcoming flight. HAS students were able to talk to astronaut Butch Wilmore during his Expedition 41 Crew News Conference and a personal visit. He later became the first astronaut to use a 3D printer in space. One student said, "This was the first experience I've ever had where I got to see what it would actually be like to act as an engineer ... I have never learned so much in one week."

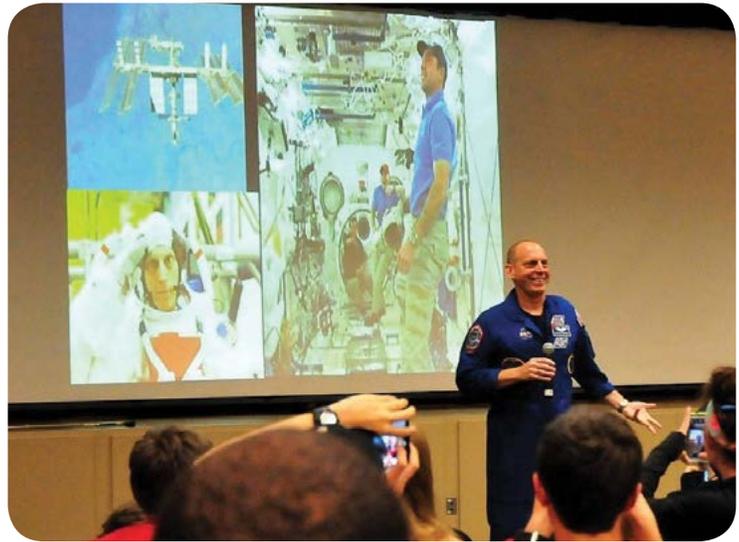


PSTI is a once-in-a-lifetime experience that will drastically expand and increase your techniques and abilities.

- Participant in the Pre-Service Teacher Institute

In-flight Education Downlinks: Talking to an astronaut in space is a pretty out-of-this-world experience, and JSC Education uses downlinks to help make that happen for students across the country. A downlink is a 20-minute question-and-answer session between astronauts onboard the space station and students at an educational organization such as a museum or a school. Students get to learn first-hand from spaceflight explorers what it is like to live and work in space. In 2014, JSC Education facilitated 14 downlinks, including three in support of the International Space Station's outreach program, Destination Station, and one at the request of U.S. Representative Lamar Smith. That downlink, at Elliott Ranch Elementary School in Elk Grove, Calif., set a new record by reaching more than 20 million people through traditional and social media. Other special events included a downlink between Sandy Hook Elementary School and Connecticut native astronaut Rick Mastracchio, and an event with Boise State University led by educator-in-residence and former astronaut Barbara Morgan.

Space Exploration Educators Conference (SEEC): Hosted by Space Center Houston, the JSC Office of Education supported SEEC by providing education specialists to conduct hands-on lessons and subject matter experts to present on NASA's ongoing missions. The office also coordinated an exposé highlighting NASA and Space Industry partners' education programs. More than 400 educators attended the three-day conference in 2014.



Summer of Innovation (Sol): The Office of Education collaborated with six partners to fulfill NASA's Sol goals and to support the 4-H National Youth Science Day activities. The day's theme of "Rockets to the Rescue!" challenged almost 1,400 youths and 41 educators to design and build an aerodynamic food transportation device that could deliver a payload of nutritious food to victims of a natural disaster, such as an asteroid strike or tsunami, where infrastructure didn't exist to support normal relief efforts. In addition, Sol's culminating STEM engagement events were conducted to celebrate the successes of longstanding partnerships and to conclude the Sol project.

Middle School Aerospace Scholars: The Texas Space Grant Consortium, in partnership with NASA JSC and the Middle School Aerospace Scholars program, offered weeklong LiftOff Aerospace professional development training for teachers. LiftOff 2014 focused on engineering and took place in Houston on July 7-11, 2014. Using the resources obtained from the training, educators had the potential to impact more than 7,000 students directly, and indirectly reach many times that number through teacher participants' sharing of the information with colleagues.



JSC Education Highlights (continued)

Lift-off to Literacy: A worldwide campaign sponsored by the International Reading Association (IRA), Lift-off to Literacy challenged teachers to engage their students in 60 extra seconds of literacy activities for 60 days, or “60 for 60”. Curriculum support materials were space themed with a special focus on the ISS. Lift-off to Literacy was a collaborative effort between the IRA, Story Time from Space, and NASA. On September 8, 2014, ISS Expedition 44/45 crewmember Kjell Lindgren pledged to take the 60 for 60 challenge during his time on-orbit and also read stories from space after he launches to ISS in summer of 2015. Lindgren’s 60 for 60 experience and videotaped story reading sessions will be featured on the IRA and Story Time From Space websites. As part of the campaign, Lindgren was featured on the cover of the back-to-school issue of *Reading Today*, an IRA magazine reaching 52,000 teachers around the world.

**N A S A
Science and Technology
Institute for Minority Institutions
(NSTI-MI):** Established in June 2006, 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. NSTI-MI combines the talent and expertise of all minority institutions through research-based fellowships, internships, co-ops and grants. JSC collaborated with two Historically Black Colleges and Universities (HBCUs) in 2014 engaging 10 students in NASA’s related research.



Steckler:

The NASA Ralph Steckler / Space Grant Space Colonization Research and Technology Development Opportunity Phase III sustains university research and development activities that support innovative research and expand technology that could pave the way for future space colonies. The late Ralph Steckler left the significant remainder of his estate to NASA “for the colonization of space because [he believed] this is for the betterment of mankind.” NASA accepted the gift under the National Space Grant College and Fellowship Act. NASA established the Steckler Space Grant to implement Mr. Steckler’s testamentary direction and to make a lasting impact on the field of space colonization.



Reduced Gravity Education Flight Program (RGEFP):

Students and K-12 educators formed research teams and submitted proposals to design, build and test an experiment aboard NASA’s reduced gravity aircraft. Selected teams worked for 6-9 months building their experiments for test flights which occurred at NASA JSC and Ellington Field. RGEFP celebrated 20 years of operation with three unique flight week programs in 2014. 32 universities and 18 K-12 schools designed experiments that were pertinent for future human space exploration.

Pre-Service Teacher Institute (PSTI):

JSC conducted its PSTI in three iterations. Each iteration included 6-8 synchronous online meetings and one week of face-to-face training. The first two iterations had a combined online portion and separate onsite experiences during May 12 - July 1, 2014. The third iteration occurred from September 22 - November 3, 2014. Participants were exposed to NASA content through subject matter expert presentations; education resources on human spaceflight and exploration; models of evidence-based teaching practices through education specialists; and JSC facilities through specially arranged tours. A total of eight MSI faculty members and 80 participants representing 11 states and 27 MSI attended the PSTI in 2014.

2014 By The Numbers

Whether it's bringing students to Johnson Space Center or bringing the International Space Station to students 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

94 foreign countries reached.

More than 2,000 community members reached directly.

More than 82,000 educators involved.

50,000+ social media fans

More than 201,000 students reached directly.

More than 27 million individuals reached virtually.

What's Next in 2015?

The JSC Office of Education's efforts in 2014 set up a strong foundation for success in future years. Many activities, like the NASA Community College Aerospace Scholars program, are advancing to the next stage, and new activities, like the ISS One-Year Crew Education Initiative and Micro-g NExT, are being designed using best practices from past activities. Here's a look at some of the exciting activities coming up in 2015.



ISS One-Year Crew Education Initiative: In 2015, American astronaut Scott Kelly and Russian cosmonaut Mikhail Kornienko will embark on a yearlong mission filled with collaborative investigations onboard the International Space Station. These investigations will yield beneficial knowledge on the medical, psychological and biomedical challenges faced by astronauts during long-duration spaceflight. To engage students and teachers across the country in the mission, JSC Education will create a one-stop-shop website dedicated to space station education materials, a national STEM challenge and more!

NASA STEM Educator Professional Development Collaborative (EPDC): The EPDC is a network of education and technology experts who collaborate with NASA STEM education professionals to bring quality learning opportunities and resources to educators. NASA education specialists present STEM content background, activities, teaching strategies and other resources to bring NASA into the classroom. Educators can earn certificates, continuing education credits, and STEM Learning Badges.



Micro-g Neutral Buoyancy Experiment Design Teams: Undergraduate students design and build prototypes of spacewalking tools to be used by astronauts for spacewalk training. The tools will be manufactured by students, then tested in the Neutral Buoyancy Laboratory at the Sonny Carter Training Facility.



JSC Internships: Efforts continue to consolidate internships under one process and work with organizations around the center, as well as space grant consortia around the country to increase available funding for students to intern at JSC in 2015.



To keep up with current
education opportunities, visit:

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

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