EDUCATION FLIGHT PROJECTS (EFP)

Administered by Oklahoma State University (OSU)
Type of Agreement: Teaching From Space Cooperative Agreement

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PROJECT DESCRIPTION

The strength of Education Flight Projects (EFP) is its capability to highlight the Agency's missions and connect education audiences to NASA content, people, and facilities. EFP activities involve K-12 students and educators in hands-on experiences and research applications aboard a variety of NASA flight platforms and in NASA ground-based research facilities. Activities offer NASA-unique science, technology, engineering, and mathematics (STEM) content, resources, and opportunities for both the formal and informal education communities. The project is national in scope and open to educators and students in grades K-12. EFP is managed by the Teaching From Space (TFS) office located at the NASA Johnson Space Center. TFS is operated under a cooperative agreement between NASA and Oklahoma State University.

EFP offers opportunities for educators and students to actively participate in NASA missions on the International Space Station (ISS) and on other NASA flight platforms, or through hands-on experiences at NASA Center laboratories and test facilities. These diverse experiences are intended to inspire, engage, and educate K- 12 students and teachers and offer them unique NASA-related STEM content and resources.

EFP has designed an "investment portfolio" approach for project management. This approach allows EFP to be innovative and develop new or redesign existing education activities quickly to meet changing priorities. The project is creative, often thinks outside the box, makes connections, and uses low-cost technology to increase the scope of activities. EFP can quickly start up new and highly visible activities. The project has the ability to expand and contract the portfolio in response to changing funding requirements.

EFP recognizes that well-trained and highly motivated educators are essential to increasing student interest and achievement in STEM. The project provides short and long duration educator professional development, both face-to-face and electronically. EFP sees value in providing educators non-traditional professional development through real world experiences. The project gives educators rich opportunities to interact and work with personnel at NASA Centers, participate in research activities, and use the Agency's exceptional resources and facilities. In FY11, EFP professional development activities utilized multiple NASA facilities and flight platforms including scientific balloons, the reduced gravity aircraft, NASA research aircraft, NASA sounding rockets, and a NASA microgravity drop tower.

EFP student activities are diverse and incorporate NASA-specific STEM content and highlight STEM-related careers. These activities allow students to engage in NASA missions through hands-on and authentic experiences. In FY11, students took Earth photographs from the ISS, interacted real-time with ISS and Space Shuttle crews, developed experiments for astronauts to perform on orbit, flew payloads on NASA weather balloons, created sports games to be played in microgravity, launched rockets to approximately one mile above the ground, and sent their images and signatures to space.

EFP seeks to continually increase, improve, and diversify its portfolio of ground-based and on-orbit education activities. In FY11, the project issued another internal call for proposals with the intent to fund development of new or expand the scope of existing education flight activities. Sixteen diverse activities based at nine NASA Centers were funded and became part of the EFP portfolio.

EFP recognizes the need for "one-stop shopping" websites for educators and students interested in specific topics. In FY11, the project developed and added new content to its suite of comprehensive education websites focused on the Space Shuttle, spacesuits, robotics, rocketry, DIY podcasts, mass vs. weight, space food, and NASA careers. EFP provided resources, including on-orbit video and subject matter experts, for multiple eClips

segments for the eClips website. These segments included a series on the legacy of the Space Shuttle titled *Because it Flew*. In response to the success of the current topic focused websites, EFP is developing a microgravity website which will launch in FY12. Educators will be able to enhance their curriculum through the website's resources, including microgravity lesson plans, interactive multimedia resources, NASA research, and microgravity experiences.

In FY11, TFS continued management of all ISS National Laboratory K-12 education activities. The office facilitated the on-orbit operations for Kids in Micro-g, a student experiment design challenge. This challenge gave students in grades 5-8 the opportunity to design an experiment or simple demonstration that could be performed both in the classroom and on board the ISS. As part of its National Laboratory responsibilities, TFS supported collaboration with LEGO for on-orbit education activities, including sending LEGO kits to the ISS and development of procedures for astronauts using the kits. Video footage of on-orbit operations will be used in education videos for the LEGO website.

EFP manages NASA-unique opportunities for educators and students that utilize the ISS. During live, in-flight education downlinks and Amateur Radio on the ISS (ARISS) contacts, astronauts answer questions from K-12 students. Host organizations are selected through a competitive proposal process. Downlinks and ARISS contacts are part of well-defined education plans developed by these organizations. During four EarthKAM missions a year, student participants direct a camera on the ISS to take photographs of specific locations on Earth. The entire collection of EarthKAM images is available in a searchable EarthKAM image archive. This image collection and accompanying learning guides and activities are extraordinary resources to engage students in Earth and space science, geography, social studies, mathematics, communications, and art.

The project coordinates on-orbit education activities including payloads and demonstrations onboard the ISS. These on-orbit education activities are used, both internally and externally, in the creation of education resources for educators and students. In FY11, EFP continued the partnership with Sesame Street by facilitating a visit by Elmo, Sesame Street's beloved Muppet, to Kennedy Space Center (KSC) for STS-135 launch events. The Elmo interviews and related activities received wide spread media attention. EEP also coordinated on-orbit video from the ISS which was incorporated in four Sesame Street episodes.

EFP is also responsible for the design, development, and execution of comprehensive long-term national education plans associated with specific spaceflight missions, particularly those on which an educator astronaut flies. In FY11, EFP started development of an education plan associated with the flight of educator and astronaut Joe Acaba, who will launch in 2012 as part of the ISS Expedition 31/32 crew. The plan includes pre-mission, mission, and post-mission components and ground-based and on-orbit activities.

EFP serves as the primary NASA Office of Education interface to the Astronaut Office and facilitates communication between the two organizations. The office frequently offers support and guidance to astronauts and astronaut office management on education-related activities and questions.

PROJECT GOALS

EFP is focused on increasing K-12 student interest and achievement in STEM. The project achieves this goal by offering unique NASA experiences to students and educators. Recognizing that hands-on, interactive, and authentic experiences are effective learning tools, EFP provides the Agency with outstanding opportunities to inspire, engage, and educate the Nation's students and educators. Student and educator participation in NASA-unique education flight activities directly contributes to NASA Education efforts to attract and retain students in STEM disciplines and strengthen NASA and the Nation's future workforce.

The vision for EFP is to: *Facilitate education opportunities that use the unique environment of spaceflight, other flight platforms, and NASA research facilities.*

The project will meet the following objectives:

1. Develop and provide NASA-unique experiences, opportunities, content, and resources to educators and students to increase K-12 student interest in STEM disciplines.

2. Build internal partnerships with NASA Program Offices, NASA Education programs, NASA Center Education offices, and external partnerships with formal and informal education communities to create unique learning opportunities and professional development experiences.

PROJECT BENEFITS TO OUTCOME 2

EFP goals align to Outcome 2 in the 2011 NASA Education Strategic Coordination Framework (www.nasa.gov/offices/education/performance/strategic_framework.html). EFP directly contributes to: *Outcome 2 – Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty.* EFP reaches K–12 educators and students through authentic, real-world, hands-on, and interactive education flight activities. The project offers "as only NASA can" experiences that focus on STEM disciplines and highlight NASA missions, content, and careers. The project collaborates with other NASA Education projects, Mission Directorates, Center Education offices, and external partners to increase the value and scope of these activities.

EFP activities offer NASA Education outstanding opportunities to implement recommendations from the National Research Council's (NRC) Review and Evaluation of NASA's Precollege Education Program Project activities are NASA unique and "capitalize on NASA's primary strengths and resources" including "the agency's scientific discoveries; its technology and aeronautical developments; its space exploration activities; the scientists, engineers, and other technical staff (both internal and external) who carry out NASA's work; and the unique excitement generated by space flight and space exploration." (Reference: 2008 NRC Report (www.nap.edu/catalog.php?record_id=12081).

In FY11, EFP significantly contributed to Outcome 2 through increased educator and student involvement in education flight activities. The project encourages participants to use these high visibility experiences to engage greater numbers of educators and students, the media, the community, families, and legislators involved in NASA missions. The project is innovative, continually seeking new ways to improve and enhance the value of project activities and incorporate current trends in the use of multimedia and new technologies to engage greater numbers of educators and students. Because many EFP activities are dependent on mission operational requirements, the total number of participants may vary each fiscal year.

The project continually evaluates its activities to insure that they are effective and successfully support Outcome 2. EFP works with each project activity to improve its individual contributions to Outcome 2. EFP provides guidance on requirements, expectations, and data collection, which result in increased benefits to Outcome 2.

PROJECT ACCOMPLISHMENTS

Innovative Project Model

EFP has an innovative project model that funds flight projects at multiple NASA Centers. This model allows the project the flexibility to expand and contract based on funding and to have the flexibility to quickly implement new activities.

- Released an internal call for proposals to identify potential partnerships with Agency education flight projects, specifically those that provide educators and student hands-on experiences, participation, and research applications on board NASA flight platforms
- Funded and managed a portfolio consisting of sixteen education activities implemented at nine NASA Centers and through external partnerships
- Continued to develop activities that utilize unique NASA assets, including flight platforms, research facilities, missions, and people

White House Initiatives

EFP has well-developed internal processes that allow the project to quickly respond to new NASA and White House initiatives and implement new activities in a short period of time.

- To support the White House Council on Women and Girls, developed WISH, a new activity for young women entering their senior year of high school; students completed on-line coursework and competed for an opportunity to spend a week at NASA Johnson Space Center interacting with NASA female scientists, engineers and researchers
- To support Joining Forces, a White House initiative focused on military families, implemented two camp models for military children; Stennis Spaceflight Center and Kennedy Spaceflight Center delivered the camps at military installations in their regions

- Facilitated the participation of a staff member from the Office of Science and Technology Policy (OSTP) in an EFP Reduced Gravity Flight experience

Internal and External Partnerships

EFP works to develop strong internal partnerships that increase the reach, scope, and value of the project.

- Managed all ISS National Laboratory K-12 education activities, including LEGO partnership and Kids in Micro-g
- Collaborated with the US Department of Energy (DoE) to bring educators from DoE and NASA together during one of the reduced gravity flight weeks
- Coordinated an education downlink for the US Department of Education for International Education Week; the US Secretary of Education and the NASA Associate Administrator for Education participated in the event
- Worked with the Astronaut Office to support education related astronaut public appearances
- Partnered with Lockheed Martin on Signatures in Space, sending 550,000 student signatures to space
- Continued to discuss new education opportunities with internal and external programs developing the next generation of space vehicles
- Coordinated high profile downlink that supported Women's History month hosted by the Urban Zen and FFAWN Foundations in New York City
- Collaborated with NASA INSPIRE to launch a new student activity based on ISS research
- In partnership with the NASA Reduced Gravity Office, funded two reduced gravity flight weeks, for the first time offering any US K-12 educator a chance to fly
- Coordinated a visit by Elmo, the Sesame Street Muppet, to the STS-135 launch; Elmo participated in social media activities and filmed education vignettes for use on Sesame Street and NASA web sites

On-orbit Activities

EFP coordinates multiple diverse on-orbit education events on board the ISS, including interactive events, Earth observation activities, and on-orbit demonstrations of STEM principles.

- Facilitated sixteen in-flight education downlinks reaching over 28,000 educators and students
- Piloted an innovative approach to leveraging non school-hour downlink opportunities that resulted in reaching over 875,000 individuals
- Conducted seven on-orbit education demonstrations that were used by TFS, and internal and external organizations in the production of educational videos
- Conducted three EarthKAM missions and one mission simulation involving 405 educators and 28,010 students
- Conducted eighty-nine ARISS contacts reaching over 18,000 K-12 students and educators around the world
- Conducted six on-orbit experiments that were designed by students as part of Kids in Micro-g and used to enhance STEM curriculum

National Initiatives

For the NASA Office of Education, EFP develops national education plans that capitalize on unique Agency events or missions.

- Began development of a national education plan to use the flight of an educator astronaut, an ISS Expedition 31/32 crewmember, as an extraordinary opportunity to inspire and engage educators and students by developing national education and promotion plans
- Engaged educators, students, and the public in commemorating the Space Shuttle Program through a suite of multi-disciplinary education activities, including an on-orbit event and a student STEM art contest

Web Presence

EFP maintains a suite of education websites used by both educators and students. EFP continues to improve these sites with new features and updates.

- Enhanced six topic focused websites including mass vs. weight, space food, DIY podcasts, robotics, rocketry, and spacesuits
- Developed Space Shuttle Education website
- Collaborated with eClips to develop *Because it Flew* video series that is posted at the eClips site
- Developing one new topic-focused website: microgravity
- Facilitated a major redesign of the Teaching From Space website
- Managed seven websites that received over 1,482,371 page views in FY11

PROJECT CONTRIBUTIONS TO PART MEASURES

EFP significantly contributes to NASA Education's FY11 APGs.

- *75,000 educators participate in NASA education programs.*
  Over 17,600 educators were in involved in EFP activities.*
- *600,000 elementary and secondary students participate in NASA instructional and enrichment activities.*
  Over 96,715 K-12 students participated in EFP activities.*

  * These numbers include both international and other NASA Education project participants. These numbers do not include participants in large scale EFP activities such as Signatures in Space (550,000); STS-133 downlink (875,000); Voyage Back to School (318); and HESTEC (13,000).

- *75% of elementary and secondary students express interest in STEM careers following their involvement in NASA education programs.*
  76% of students in EFP activities express interest in STEM careers.

- *5,000 educators use NASA resources in their curricula after participating in NASA professional development.*
  63% of educators who completed the 120 day survey indicated that they use NASA classroom materials.

IMPROVEMENTS MADE IN THE PAST YEAR

EFP continues to develop and refine models for the project. Building on the successful internal call for proposals in FY09 and FY10, the project released another call in FY11. Processes for the selection of new education activities continued to be improved.

EFP created a process to monitor, enhance, and consistently update existing websites to ensure relevancy and promote return visits. In FY11, lessons learned were incorporated into the redesign of existing EFP websites by implementing new design treatments. Lessons learned were also incorporated into the development of the microgravity website and kit. The microgravity website will assist educators in understanding gravity. Resources and experiences were mapped to specific grade levels and standards.

EFP continues to work to improve communication with collaboration partners at NASA Centers. Utilizing the expertise of a professional external evaluator, the project developed and implemented an electronic survey for partners who asked for lessons learned, activity highlights, and ideas to strengthen synergy between the EFP partners. The results will be analyzed and incorporated into FY12 activities and business processes.

The project assesses activities and seeks input from evaluation experts in an effort to continually improve its contributions to Outcome 2. In FY11 the project commissioned a professional evaluation of In-flight Education Downlinks and completed follow up on the Reduced Gravity Opportunity (RGO) Flight Week evaluation of FY10. The evaluations were conducted by Technology for Learning Consortium Inc. and identified both strengths and weaknesses of each activity. Both evaluations will assist EFP in conducting more successful activities including the development of an on-line learning environment that will provide future RGO participants with long-term professional development.

Working with internal and external partners, EFP sought new opportunities to engage underrepresented and underserved students and educators in its activities. The project supported Hispanic Engineering, Science, Technology Week (HESTEC), downlinks with diverse student and educator audiences, and Summer of Innovation student and educator activities. EFP also funded WISH, a new national activity for young women, rising high school seniors who participate in on-line STEM lessons. Selected students were invited to spend a week at a NASA Center and interact with female NASA engineers and scientists.

In FY11, the Teaching From Space office continued to hire professional educators with diverse backgrounds and experiences in both urban and rural schools to support EFP. The current office staff consists of educators with

experience in pre-kindergarten – 12th grade, and multiple STEM disciplines including Mathematics, Physics, Earth and Space Science, Biology, Educational Technology, and Technology Education.

PROJECT PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

EFP management works closely with Oklahoma State University (OSU), through the Teaching From Space (TFS) Cooperative Agreement (#NNX09AC24G), on all elements of the project. OSU provides the highly skilled TFS staff that is responsible for daily EFP operations. OSU supports major project initiatives as well as the continuous evaluation of the project's activities.

EFP recognizes that partnering with other NASA Education projects and activities is mutually beneficial and has the potential to increase the worth and reach of all associated projects and to result in enhanced continuity between NASA Education portfolio elements. The project also seeks opportunities to work with NASA Center Education offices and Mission Directorates to develop and deliver EFP activities. The project works closely with appropriate NASA Program and Project Offices, to identify flight opportunities, and content for and subject matter experts to participate in the project's activities. EFP also collaborates with external education organizations to expand the scope and value of its activities. Key internal and external partners in FY11 included: Sesame Street, LEGO, US Department of Education, US Department of Energy, Sally Ride Science, USA Today, American Chemical Society, NASA Endeavor Science Teacher Certificate Project, Science, Engineering, Mathematics and Aerospace Academy (SEMAA), National Institute of Aeronautics (NIA), Japan Aerospace Exploration Agency (JAXA), European Space Agency (ESA), National Science Teachers Association (NSTA), ISS National Lab, ISS Program Office, NASA Education Technology Resources (NETS) NASA Digital Learning Network (DLN), Lockheed Martin, NASA eProfessional Development, NASA Educator Resource Center Network, NASA Aerospace Education Services, Space Operations Mission Directorate, Exploration Mission Directorate, National Air and Space Museum, Boy Scouts of America, and Space Center Houston.