

NASA Aerospace Education Services Project
Administered by Pennsylvania State University
Cooperative Agreement Number NNX07AQ96A
Cecelia Fletcher, AESP Project Manager
Langley Research Center
757-864-2339

PROJECT DESCRIPTION

Utilizing NASA content, the Aerospace Education Services Project (AESP) provides formal and informal educator professional development (PD) to the elementary and secondary education community providing classroom demos, distance learning events, in-service training for educators, pre-service training for university students, and identification of appropriate NASA education resources. Based upon research-supported best practices, AESP efforts are targeted at providing long duration PD to educators. Long duration PD consists of direct educator interactions greater than two days in duration. AESP also motivates students to continue their study of science and mathematics throughout their school experience by providing NASA products to educators and students. Through utilization of NASA materials, students better understand how STEM content is relevant to them. Because educators are better able to use engaging, real-world material in their classrooms, students become more motivated to consider pursuing a career within the NASA workforce pipeline or other STEM careers.

AESP is responsible for:

- Assisting STEM educators in understanding how to incorporate NASA’s research and education portfolio into their curriculum, aligning content with core standards and developing engaging, innovative, and research-based learning activities.
- Establishing the NASA Education Online Network (NEON) for the education and STEM communities creating synergy among STEM educators and NASA scientists and engineers across the nation. NEON is an online learning community for educators, scientists and engineers that provides opportunities for PD and training grounded in education research while also reflecting current and future NASA science and exploration missions.

AESP staff consists of Education Specialists who are experienced STEM teachers located at NASA’s 10 Centers. AESP provides customized and unique PD programs for educators in all 50 states and US territories that are aligned to local, state and national standards which lead to high quality STEM training and sustainability.

AESP is managed out of NASA Langley Research Center and implemented by The College of Education at Pennsylvania State University under a five-year cooperative agreement that was awarded in 2007. PSU hires and supervises the Education Specialists who cover all of the 50 states and territories. In addition, PSU implements the NEON website for NASA.

PROJECT GOALS

In order to more effectively support the NASA Strategic Plan and the Office of Education performance metrics, AESP focuses its efforts on the following goals:

- Work closely with higher education to strengthen pre-service and in-service teacher education at colleges and universities where NASA R&D is conducted.
- Shift the focus of Education Specialist school visits from one-time visits and school assemblies to efforts that strengthen educator PD by striving for long-duration PD sessions.

- Participate strategically in conferences such as state and regional science teachers' meetings.
- Work early with new NASA projects that are planning K-12 components, to contribute ground-truth perspective on the actual needs of teachers, state curriculum standards, and mechanisms for training and dissemination.
- Facilitate collaborations between K-12 schools and university and industry-based scientists and engineers.
- Utilize technologies to reduce distance, deliver customized solutions, and support collaboration.

PROJECT BENEFIT TO OUTCOME 2

All AESP activities are designed to support NASA's Strategic Plan and the Office of Education's Outcomes. The goals of AESP align specifically to Outcome 2 to "*attract and retain students in STEM disciplines through a progression of education opportunities for students, teachers and faculty.*"

- AESP provides educators and students with NASA-related STEM tools, experiences and opportunities to further their education through educator workshops, classroom demonstrations, parent programs and classroom resources. AESP provides authentic NASA hands-on activities based on NASA missions, for example, the Human Exploration and Operations Mission Directorate's popular Rocket Educator Guide is frequently used. Education Specialists are committed to ensuring that the educator professional development (PD) material and experiences provided support the educator's needs and align with core standards. AESP supports numerous informal education programs and activities at science centers, museums, and related facilities.
- In FY11, 22,333 educators participated in long duration and short duration AESP STEM PD opportunities. A 120-day follow-up survey of a sample of teacher participants indicates that, among those who participated in AESP STEM PD, approximately 85% subsequently used NASA resources in their classrooms.
- AESP offers student programs in support of PD efforts to engage and retain students in STEM education and encourages them to pursue educational disciplines that are critical to NASA's future engineering, scientific and technical missions. Through AESP, 81,382 students participated in NASA instruction and enrichment activities in FY 11.

PROJECT ACCOMPLISHMENTS

- Over 103,700 students and teachers were reached either through STEM-related student activities or STEM educator PD in FY 2011. Listed below is additional information concerning the AESP interactions with students and teachers.
 - Over 81,000 students and 22,000 teachers were reached by AESP. Of these numbers, ~41,000 were middle school students and ~10,000 were middle school teachers.
 - AESP educational specialists reached 17,870 in-service and 3,142 pre-service teachers through PD workshops and activities. In addition, another 1,321 educators were involved in other AESP activities conducted this year. Based upon OEPM data for FY 2011 to-date, AESP is the highest contributor of all NASA education projects to the NASA Annual Performance Goal pertaining to "Number of educators participating in NASA education programs".

- The number of educators participating in long-duration PD was 4,835, a 61% increase in long-duration PD over FY 10 productivity. Short duration PD was delivered to 17,498 educators, primarily as recruitment for long duration PD, exceeding the FY 2011 objective of 13,500 by 30%.
 - AESP provided over 244,000 quality NASA STEM curricular support resources and materials to educators, students, administrators, faculty and parents/guardians.
 - More than 400 school visits were conducted by AESP in FY 2011.
- In FY 2011, AESP celebrated the project's 50 years of providing NASA STEM education activities and PD workshops throughout the 50 states and United States territories. The celebration took place at the 2011 National Science Teachers Association (NSTA) annual conference. Over the two-day, multi-session workshop, 1,142 participants were provided 26 PD workshops on NASA content and an overview of NASA education.
- AESP deployed a web-based peer-to-peer educator PD site in June 2010, the NASA Educator Online Network (NEON), <http://neon.psu.edu> that has experienced tremendous growth. NEON's goal is "to create a large, vibrant online community of educators, scientists, and engineers that engage in projects designed to improve teaching and learning."
 - The FY 2011 annual objective to grow NEON to 3,000 members was surpassed by ~46%. As of September 30, 2011, NEON membership was 4,367 with a membership of 3,276 certified teachers, 619 other educators, 129 scientists and engineers, and 139 NASA staff members.
 - The FY 2011 annual objective to establish NEON as NASA education infrastructure, used by at least 5 NASA Education programs was also surpassed. There were a total of 207 groups on NEON at the end of FY 2011, 42 were NASA education groups that derived from NASA education projects and one mission directorate. The core NASA Education groups on NEON are: Aerospace Education Services Project, Central Operation of Resources for Educators (CORE)/Educator Resource Center Network (ERCN), Interdisciplinary National Science Program Incorporating Research and Education Experience (INSPIRE), Learning Environment and Research Network (LEARN), NASA Explorer Schools (NES), Summer of Innovation (SoI), and Teaching From Space (TFS).
 - A "NEON Resource Repository" was developed and became operational in June 2011. As of the end of FY 2011, 184 lesson plans, videos, and other resources had been posted in the Resource Repository.
- AESP provided HQ-requested support for several important events in FY 2011 including the International Astronomical Congress, a US Department of Education Conference briefing and several presentations in conjunction with the NASA Administrator and the Education Association Administrator.
- "WHEELS" is a Human Exploration and Operations Mission Directorate (HEO)-funded project for which AESP provides educator PD "tie-in" activities that coincide with Exploration Experience visits across the country. In FY11, 19 WHEELS events were supported and 355 in-service teachers, pre-service teachers, and other educators received instruction using HEO-developed materials in the classroom. AESP also worked with 1,914 K-12 students and 1,734 adults who were present.

- AESP and Summer of Innovation (SoI) Curriculum Specialists were heavily involved with SoI activities this year. AESP provided major curriculum development support to SoI. Ninety-three lesson plans were developed and these lesson plans incorporated 200 NASA activities. These contributions required over 800 hours (5 months) of effort, and were accomplished by AESP core staff prior to hiring the new SoI personnel. Overall, SoI work touched 2,298 in-service, and pre-service educators, and another 398 informal educators who were present during SoI events. AESP Education Specialists and the SoI Curriculum Development Specialists were involved with 119 events this year which reached 2,483 middle school students. Please read SoI annual report for further details on SoI.
- Aeronautics Research Mission Directorate (ARMD) and the Office of Education provided funds to enable the 2nd year of the Simulation-Based Aerospace Engineering Teacher PD Program in FY 2011. Media release for the Sim-Aero program was distributed by the national press association, publicizing the program on hundreds of websites. Lessons developed in the Sim Aero workshop are available at https://simaero.rti.org/pages/MODSIM_Lessons.aspx. Some of these lessons are being incorporated into a Modeling and Simulation Flexbook. FlexBook, is a trademark of the CK-12 Foundation. CK-12 stands for “Content K-12”. CK-12 is a non-profit organization that develops free online, educational textbooks. In July of 2011, NASA signed a Space Act Agreement in FY 2011 with the CK-12 Foundation to develop the Modeling and Simulation FlexBook.
- AESP specialists have updated many of their workshops and prepared them for delivery via virtual and online technologies. Long duration PD is more easily sustained through the use of these methods of delivery. Specialists conducted 53 online events (Skype, Adobe Connect, WebEx) and 19 Digital Learning Network presentations as part of their FY 2011 efforts. Using these forms of distance technology, 1,414 teachers, 3,726 students, and 140 adults (a subset of the numbers listed above) were reached.
- AESP conducted a National Space Grant Foundation (NSGF) mini-grant program which is concluding its 3rd and final year. The program selected 11 Space Grant Affiliations of Colleges and Universities who developed standards-based and sustainable courses for pre-service and in-service teachers using NASA STEM content.
- Education Specialists worked at the state level, commenting on drafts of state standards (PA), sitting on state STEM advisory boards (MA), adding appropriate NASA resources to required curricula (DE), attending Department of Education meetings as new standards rolled out (AL, FL, and others) and serving on boards or panels for state math and science education organizations (TX, ID, WA and others).
- Several specialists continue to serve on national education organization boards and/or their working committees such as NSTA, John Glenn Science Center Task Force, and the Washington State Education Leaders Advisory Board.
- AESP provided Race to the Top support in FY 2011. Examples of support provided include: AESP conducted summer in-service workshops for the University of Tennessee at Chattanooga. AESP worked with Metro-Nashville Public schools in the use of web tool applications for interactive student learning with NASA. AESP also has a member on the STEM Council of Massachusetts acting as a NASA resource person to the state on STEM issues in education.

- In FY11, AESP Specialists attended 77 conferences. National conference participation included NSTA, National Science Education Leadership Association, the GLOBE Foundation, the National Council of Teachers of Mathematics, the Space Exploration Educators Conference, the Association for Supervision and Curriculum Development, the National Middle School Association Conference, and the Bureau of Indian Affairs Summer Institute, along with many state and regional conferences in STEM education.
- An AESP Education Specialist received the NJ Science Teachers Association's Atkins Award which recognizes "Outstanding cooperation with and service to the Science Teachers of the State of New Jersey" this year.
- Numerous AESP employees received prestigious NASA recognition in FY 2011. Twenty-seven recipients received the NASA Headquarters Group Achievement Award for the SoI Pilot Project, 7 employees received the NASA Group Honor Award for their outstanding support of the ModSim Teacher PD Pilot Team, and 1 employee received a NASA Group Achievement Award for Teaching from Space.
- The PSU Director of AESP is working with NASA's Goddard Space Flight Center (GSFC) and Tor/Forge Books to develop and publish "NASA-inspired works of fiction." The books will highlight concepts relevant to current and future NASA missions and operations. The Space Act Agreement was signed in July of FY 2011 with the Innovative Partnerships Program at GSFC and Tor/Forge Books.

PROJECT CONTRIBUTIONS TO PART MEASURES

***Part Measure 3:** 75,000 educators participate in NASA education programs*

22,333 teachers, both in-service and pre-service, along with informal educators participated in AESP PD opportunities in FY 2011.

***Part Measure 5:** 600,000 elementary and secondary students participate in NASA instructional and enrichment activities*

AESP provided NASA experiences that inspired over **81,000** elementary and secondary students' interest in STEM disciplines in FY 2011. Of the total students reached, **41,287** were middle school students.

***Part Measure 7:** 5000 educators use NASA resources in their curricula after participating in NASA professional development*

403 educators reached by AESP responded to the **short duration** follow-on survey. Of that number **85%** of the educators had used the NASA materials in their classrooms following AESP-sponsored activities according to the Office of Education Performance Measurement (OEPM) system.

63 educators reached by AESP responded to the **long duration** follow-on survey. Of that number **100%** of the educators had used the NASA materials in their classrooms following AESP-sponsored activities according to the OEPM system.

IMPROVEMENTS

Collaborations:

- AESP's successful competitive award from HEO WHEELS was renewed for a 3rd year, which demonstrates AESP's ability to leverage other resources, and, in turn enable other projects to take advantage of AESP to deliver services nationwide.
- AESP received significant funding from the SoI project for on-line curriculum development support and PD support of national awardees in FY 2011.
- The following NASA projects have utilized the NEON community to enhance their programs: NASA Explorer Schools (NES), the NASA electronic PD Network, NASA Network of Educator Astronaut Teachers (NEAT), NASA EDGE, NASA Interdisciplinary National Science Project Incorporating Research and Education Experience (INSPIRE), and NASA Educator Resource Centers.

Efficiencies:

- AESP developed a "network of PD Providers" which includes museums, science centers, colleges, universities, state department of education-supported regional education service centers, and NASA educator resource centers that facilitate workshops and help to customize the delivery of resources to best meet the needs of the educators being served.
- AESP developed a "network of Pre-service Teacher Education Institutions" consisting of over 50 colleges/universities that can assist with the development of pre-service educations.
- AESP established NEON as NASA Education infrastructure and developed a "NEON Resource Repository" in response to requests by NEON users to better share and organize resources.
- AESP is looking to expand its reach ("scalability") by using a Train-the-Trainer process. The plan is to provide workshops for selected "Master Teachers". In theory, these "Master Teachers" would attend an AESP train-the-trainer workshop and receive a "certification" to train other educators on specific NASA content. These Master Teachers would then go back to their school and provide PD workshops for other educators on that content.

Diversity:

- AESP employees provided Language Assistance Services for NASA Conducted Programs and Activities in FY 2011 as follows:
 - In Puerto Rico, Education Specialists verbally translated students' and teachers' surveys into Spanish in order to facilitate the completion of required surveys. They also translated SoI PowerPoint slides and lesson activities into Spanish and assisted Puerto Rico teachers in the development of a manual with translated SoI content. AESP will be translating additional SoI activities into Spanish at the request of Puerto Rico in the near future.
 - AESP employees also supported Univision events where it was required that the Education Specialist be bi-lingual due to the participation of Spanish-speaking families in the event.

- NASA strives to ensure that underrepresented and underserved students participate in NASA education programs to encourage more of these students to pursue STEM careers. AESP is committed to serving all communities with special focus on underserved/underrepresented students and institutions. AESP serves very large numbers of schools in rural communities and schools with a majority of low-income students. The FY 2011 diversity accomplishments are provided below:
 - There were more than 80 visits to K-12 schools, 108 teacher workshops, and 10 informal education events in rural communities in FY 2011.
 - There were also 5 events at Historically Black Colleges and Universities (HBCUs) and 4 events at Native American institutions.
 - AESP also held or supported 47 events at Hispanic Serving Institutions and primarily Hispanic K-12 schools in FY 11 that included 1,113 teachers, 3448 K-12 students, and 285 undergraduate students. Whenever possible, events were lead by bilingual, Hispanic AESP Education Specialists.

- In FY 12, AESP will strive to exceed the FY 2011 diversity accomplishments by 20%.

Project Management:

- Pennsylvania State University (PSU) hired a SoI Curriculum Development Manager and seven SoI Curriculum Development Specialists with extraordinarily impressive credentials to support SoI.

PROJECT PARTNERS

- AESP partners with NASA mission directorates and other NASA education projects to deliver educator PD and student activities. AESP has received funding from:
 - HEO for WHEELS to offer teacher PD workshops in areas near the Exploration Experience Outreach Trailer and to write curriculum for Desert RATS
 - ARMD/Education for the Simulation-Based Aerospace Engineering Teacher PD program
 - SoI for on-line curriculum development and PD support for national awardees
 - NASA Innovations in Climate Change Education for teacher workshops.

- AESP has funded sub-awards issued by the National Space Grant Foundation for pre-service and in-service training on NASA thematic modules at Space Grant institutions.

- AESP collaborates with organizations across the country. These relationships facilitate the development and delivery of workshops and help to customize the delivery of resources to best meet the needs of the educators being served. This network includes museums and science centers, colleges and universities, state department of education-supported regional education service centers, and NASA educator resource centers.

- AESP has established a new collaboration with the Association of Middle Level Education (AMLE), which was formerly known as the National Association of Middle Schools, to provide ongoing PD to AMLE members with the ultimate goal of improving STEM teaching in the middle grades in schools across the nation. The AMLE is the only national education association dedicated exclusively to those in the middle grades. The current terms of the agreement are:
 - AESP to present at AMLE national or regional conferences
 - AMLE to provide regional and district workshops for middle level educators. AESP to present PD offerings at these workshops
 - AESP to provide initial face-to-face PD offerings for the AMLE educators followed by on-line PD to facilitate long duration PD.
 - AMLE to advertise AESP workshops and NASA events of the AMLE website
 - AMLE to add NASA links to the AMLE website
 - AESP to write articles for the AMLE journals (1st article will be ready in the spring of 2012)
 - Possibilities of AESP to present at Title I conference in collaboration with AMLE

- AESP has had initial discussions with NSTA and Teach for America concerning partnership opportunities. Both have expressed great interest in working with AESP. Additional dialogues will take place in FY 2012 to prioritize collaboration opportunities.