NASA STEM Educator Professional Development Collaborative

Minority University Research and Education Programs (MUREP)
Science, Technology, Engineering and Math (STEM)
IE and EPD
NASA Langley Research Center
Fiscal Year 2015 Annual Report

Activity Manager: Karen Fallon
Email address: Karen.Fallon@nasa.gov
PI: Araceli M. Ortiz
Email address: Araceli.Ortiz@nasa.gov


**Activity Description**

NASA provides financial support (grants and cooperative agreements) to the Nation’s Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs), Asian American and Native American Pacific Islander-Serving Institutions (AANAPISIs), Tribal Colleges and Universities (TCUs), American Indian and Alaskan Native Serving Institutions (AIANSIs), Predominantly Black Institutions (PBIs) and eligible community colleges. The Administration recognizes the valuable role that these institutions play in educating our citizens, as reflected in the five Minority-Serving Institutions (MSI) focused Executive Orders signed by the President.

NASA’s Minority University Research and Education Activity (MUREP) investments enhance the research, academic, and technology capabilities of MSIs through multi-year awards. Awards assist faculty and students in research and provide authentic STEM engagement related to NASA missions. These competitive awards provide NASA specific knowledge and skills to learners who have been historically underrepresented and underserved in STEM. MUREP investments also assist NASA in meeting the goal of a diverse workforce through student participation in internships, scholarships, and fellowships at NASA Centers and JPL.

NASA STEM Educator Professional Development Collaborative (EPDC) is a transformative, diversity-focused STEM educator professional development system with a national scope. Funded under the direction of the Minority University Research and Education Program (MUREP) through a $15 million five-year cooperative agreement between NASA and Texas State University, EPDC provides a multitude of face-to-face and online professional development opportunities and NASA resources for educators in K-12, university, and community settings.

Launched in September, 2014, EPDC had a productive year filled with organizational establishment milestones such as the hiring of EPDC Educational Specialists at each of the 10 NASA Centers, the launch of a new website and a national event registration &
management system. In addition, a wide variety of professional development offerings were designed and delivered to the program's four main audiences: preservice teachers (teachers in training), teachers, informal educators and faculty who prepare teachers.

Activity Goals

NASA STEM EPDC provides a multitude of face-to-face and online professional development opportunities and NASA resources for educators in K-12, university, and community settings. EPDC's scope of work is organized around five foundational principles:

1) attention to the educator across the professional continuum,
2) respect for the culture and language of the learner,
3) openness to sharing learning and harnessing the power of scholar/expert partnerships,
4) boldness to leverage the potential of massive online learning and badging systems, and
5) commitment to create an innovative national impact evaluation model that gets to the heart of professional learning and behavior change.
Activity Benefit to FY2015 Performance Goals:

The EPDC scope of work aligns closely with the 2014 NASA strategic goals and objectives, the Federal STEM Education 5-Year Strategic Plan developed by the National Science and Technology Council Committee on STEM Education, and the national curriculum standards put forth in the *Framework for K-12 Science Education, the Next Generation Science Standards, and the National Common Core Standards in Mathematics*. Specifically, EPDC is guided by NASA Strategic Objective 2.4: Advance NASA and the nation's STEM education and workforce pipeline by working collaboratively with other agencies to engage students, teachers and faculty in NASA’s missions and unique assets. In addition, EPDC directly addresses the Co-STEM priority goals of improving STEM instruction, building and using evidence-based approaches, better serving groups historically underrepresented in STEM fields, and building new models for leveraging assets and expertise.
Activity FY 2015 Accomplishments

EPDC’s foundational principles are operationalized by the leadership team at Texas State University, the EPDC specialists assigned to the NASA Centers, and EPDC partners including the MSI Teacher Education Network and two supporting entities that help deliver EPDC’s online professional development offerings. The EPDC leadership team has extensive experience in grant management and the facilitation of large-scale, multi-institutional collaborative STEM education efforts. Dr. Araceli Ortiz, director of the LBJ Institute for STEM Education and Research, is the principal investigator of the NASA STEM EPDC, and Dr. Leslie Huling, professor in the Department of Curriculum and Instruction, is project director.

The leadership team oversees the work of 10 EPDC Specialists headquartered at NASA Centers across the U.S., various networks involving partner Minority Serving Institutions (MSIs) and school districts, and subcontractors that help in the design and online delivery of the professional development offered by NASA STEM EPDC. The EPDC Educational Specialists employed and assigned to the NASA Centers include:

- Ms. Maria Chambers
  Ames Research Center

- Dr. Barbara Buckner
  Armstrong Flight Research Center

- Ms. Susan Kohler
  Glenn Research Center

- Ms. Kelly Hartford
  Goddard Space Flight Center

- Ms. Sandra Kaszynski
  Jet Propulsion Laboratory
The FY 15 accomplishments of NASA EPDC are outlined below as they relate to each of the five EPDC underlying principles.

**Principle 1: Attention to the educator across the professional continuum**

EPDC is committed to providing professional learning for educators throughout their careers spanning from preservice training through the induction and in-service years of teaching, and into educational leadership roles. Special emphasis is also provided to those educators who prepare STEM teachers as well as home school educators and informal educators who work in museums, afterschool and summer programs, and other community organizations. Further, EPDC sponsors various types of online professional development as well as face-to-face professional development. A central online event registration system allows EPDC to easily track the number of professional development events delivered and the number of participants served by role group. Below is a breakdown of EPDC’s professional development events by event type and role group served.
### FY 2015 Events:

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online Webinars</td>
<td>183</td>
</tr>
<tr>
<td>Online Webshops</td>
<td>16</td>
</tr>
<tr>
<td>On-site</td>
<td>101</td>
</tr>
<tr>
<td>Off-site</td>
<td>43</td>
</tr>
</tbody>
</table>

#### 2015 Year-to-Date EPD Events

- **Online Webinar (183)**
- **Webshops (16)**
- **On-Site (101)**
- **Off-site (43)**
### 2015 Participants Served by Month

<table>
<thead>
<tr>
<th>Category</th>
<th>Elem. School Teachers</th>
<th>Middle School Teachers</th>
<th>High School Teachers</th>
<th>Pre Service Teachers</th>
<th>Higher Ed. Faculty</th>
<th>Admin</th>
<th>Informal Educators</th>
<th>Other</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan. *</td>
<td>101</td>
<td>70</td>
<td>52</td>
<td>52</td>
<td>48</td>
<td>1</td>
<td>5</td>
<td>7</td>
<td>336</td>
</tr>
<tr>
<td>February</td>
<td>118</td>
<td>334</td>
<td>253</td>
<td>108</td>
<td>1,284</td>
<td>8</td>
<td>80</td>
<td>0</td>
<td>2,185</td>
</tr>
<tr>
<td>March</td>
<td>735</td>
<td>612</td>
<td>197</td>
<td>50</td>
<td>109</td>
<td>23</td>
<td>302</td>
<td>52</td>
<td>2,080</td>
</tr>
<tr>
<td>April</td>
<td>318</td>
<td>340</td>
<td>152</td>
<td>492</td>
<td>55</td>
<td>55</td>
<td>104</td>
<td>3,131</td>
<td>4,647</td>
</tr>
<tr>
<td>May</td>
<td>272</td>
<td>209</td>
<td>78</td>
<td>20</td>
<td>58</td>
<td>4</td>
<td>53</td>
<td>5,820</td>
<td>6,514</td>
</tr>
<tr>
<td>June**</td>
<td>296</td>
<td>320</td>
<td>135</td>
<td>78</td>
<td>75</td>
<td>8</td>
<td>122</td>
<td>105,510</td>
<td>106,544</td>
</tr>
<tr>
<td>July</td>
<td>133</td>
<td>182</td>
<td>76</td>
<td>166</td>
<td>93</td>
<td>0</td>
<td>53</td>
<td>83</td>
<td>786</td>
</tr>
<tr>
<td>August</td>
<td>74</td>
<td>363</td>
<td>197</td>
<td>26</td>
<td>43</td>
<td>2</td>
<td>263</td>
<td>195</td>
<td>1163</td>
</tr>
<tr>
<td>September</td>
<td>320</td>
<td>501</td>
<td>262</td>
<td>153</td>
<td>190</td>
<td>40</td>
<td>50</td>
<td>2,828</td>
<td>4,344</td>
</tr>
<tr>
<td>Year</td>
<td>2,367</td>
<td>2,931</td>
<td>1,402</td>
<td>1,145</td>
<td>1,955</td>
<td>141</td>
<td>1,032</td>
<td>117,626</td>
<td>128,599</td>
</tr>
<tr>
<td>Year</td>
<td>2,367</td>
<td>2,931</td>
<td>1,402</td>
<td>1,145</td>
<td>1,955</td>
<td>141</td>
<td>1,032</td>
<td>***</td>
<td>***</td>
</tr>
</tbody>
</table>

*EPDC specialists began Texas State employment on January 21, 2015

**EPDC specialists participated in NASA supported events attracting large numbers of educators.

***Deducted 100,000 exhibit visitors that qualified as reportable educators reached in order to better represent the true number of educators who received an educational experience of at least 1 hour: **28,599 over the year.**

### Principle 2: Respect for the culture and language of the learner

NASA STEM EPDC is committed to helping teachers provide high-quality STEM education for all students through the use of culturally responsive instructional strategies that promote success among diverse student populations. Such a commitment requires
reaching out to educators and tailoring professional development that meets the needs of their students and addresses educator priorities.

To operationalize this commitment to this principle, EPDC has developed professional development specifically on the topic of Culturally-Responsive STEM Education. For example, Texas State in April piloted the first in a series of face-to-face workshops with MSIs that was conducted at Huston-Tillotson University in Austin, TX. A total of 32 preservice and in-service teachers from two MSIs participated in the event along with the STEM teacher educators from these two programs. The evening workshop and “learning supper” was titled “Recognizing and Fostering the Ingenuity of All Students in the STEM Classroom” and was led by Dr. Araceli Ortiz, PI of the NASA STEM EPDC.

In other work related to this principle, the MSI Teacher Education Network faculty have been producing a video series on culturally-responsive STEM education and have been reviewing NASA resources to identify those resources that could be enhanced through the inclusion of culturally-responsive teaching approaches.

Further examples of EPDC’s work to support culturally-responsive STEM education are described in the contributions of the EPDC MSI Teacher Education Network and the EPDC Emerging Stars Networks (included in Principle 3) and the U.S. Satellite Community Ambassadors Initiative (included in Principle 4).

**Principle 3: Openness to sharing learning and harnessing the power of scholar/expert partnerships.**

Minority Serving Institutions (MSIs) from across the U.S. are not only essential partners in the preparation of the next generation of STEM teachers, but faculty in these institutions have a wealth of expertise to share about working with diverse learners and the integration of culturally relevant instructional strategies that promote the STEM success of all students. For these reasons, EPDC has established two networks of MSIs to partner in the
advancement of our educator professional development work and to ensure that EPDC services are delivered where they are most needed.

**The MSI Teacher Education Network**--The MSI Teacher Education Network (MSI TEN) is comprised of STEM Education faculty members from Texas State University and five partner MSI universities that provide specialized expertise in the field of culturally relevant STEM pedagogy. The MSI TEN partner institutions that have EPDC subcontracts to work collaboratively with the Texas State STEM Education faculty and the EPDC leadership team include:

1. Norfolk State University,
2. North Carolina Central University,
3. University of South Florida,
4. Salish-Kootenai College, and
5. California State University, Northridge

The MSI TEN faculty met with the EPDC specialists in January at their kick-off meeting in Austin, have worked collaboratively in monthly online work sessions, and returned to Texas State for their yearly meeting conducted May 16-18 at the LBJ Institute for STEM Education and Research. The group has developed a white paper on Cultural Diversity in the STEM Classroom and this working paper is being used to inform the development of culturally inclusive lesson framework. The MSI faculty members are currently piloting this framework in evaluating selected NASA Curriculum activities to identify areas that can be strengthened in order to make the activities more relevant to diverse student populations. The group is also utilizing the framework to formulate instructional activities that can be shared with the EPDC specialists for use with the educators they serve.

MSI TEN faculty members are also engaged in revising both undergraduate and graduate courses to include additional NASA resources and to emphasize culturally responsive pedagogy and are conducting professional development activities for their university colleagues and teacher candidates on these topics.
**Emerging Stars Network**—An additional network of MSIs advancing the work of the EPDC is the Emerging Stars Network. These MSI institutions are committed to enriching their STEM teacher preparation programs and value professional development in STEM Education for their faculty. EPDC specialists at the NASA Centers frequently provide online professional development for the Emerging Stars institutions. Plans are underway to begin adding MSI to the EPDC Emerging Stars Network and to identifying faculty representatives at each member institution that can help coordinate professional development for the institution and facilitate communication with faculty and students about NASA professional development opportunities and resources.

**EPDC School District Partnerships**—**EPDC leadership believes that** professional development is most effective when it engages teachers in meaningful work with their professional colleagues over a period of months or years. Toward this end, EPDC is cultivating partnerships selected school districts to provide personalized professional development utilizing NASA PD resources that is recognized and valued by school districts. By working closely with the district in an ongoing manner, EPDC Educational Specialists and university faculty can not only design and deliver professional development tailored to a district’s specific need but they can also help teachers identify other specific NASA professional development opportunities such as summer institutes, webinars, and badging opportunities tailored to their individualized needs and interests. Arrangements are made with districts to provide teachers with continuing education or district PD credit and/or other incentives that encourage and reward their participation.

A recent example of such work is professional development being delivered by EPDC in partnership with Brownsville ISD. In the summer, approximately 20 Brownsville ISD middle school mathematics teachers participated in a week-long EPDC summer institute delivered at Texas State University in San Marcos and Johnson Space Center in Houston. A second example of this type of work is an upcoming EPDC event that will involve school districts in the Huntsville, AL area near Marshall Space Flight Center. On November 2, a professional development day tailored specifically for three area districts will be delivered.
by the 10 NASA EPDC specialists who will be in the area attending the EPDC Annual Meeting at Marshall Space Flight Center.

**Principle 4: Boldness to leverage the potential of massive online learning and badging systems.**

A number of avenues support the online learning opportunities offered by EPDC. Site licenses for 12 large-capacity Adobe Connect classrooms were acquired by EPDC so that the specialists at each of the 10 NASA Centers could have his/her own classroom though which to conduct their weekly webinars and other online professional development offerings. All of the Adobe classrooms can accommodate up to 100 participants, and one classroom that can be reserved by the EPDC specialists can accommodate up to 500 participants. Shortly after the EPDC specialists were employed they began offering EPD webinars weekly on a wide variety of STEM topics. These webinars are publicized through the newly developed EPDC website (www.txstate-epdc.net) as well as NASA Express, a weekly communication that is disseminated to more than 20,000 subscribers and is available to approximately 11 million NASA Twitter followers.

The EPDC website that was launched in January publicizes all upcoming EPD events with a direct link to the EPDC event registration site and provides new blog entries on an ongoing basis that shares various STEM teaching strategies and NASA resources. In addition to the EPDC specialists, blog submissions are received from faculty at the EPDC MSI partner institutions and the EPDC leadership team, ensuring a continuous flow of new content on the website.

The **U.S. Satellite Community Ambassadors Initiative** is an online professional development vehicle for reaching educators wherever they may be employed co-facilitated by EPDC and its partner **U.S. Satellite Laboratory**, the developer of the NASA **Endeavor Science Teaching Certificate Project**, sponsored by NASA from FY09-FY13. This initiative will train, support, and follow 300 middle school STEM educators from 50 states...
and US Territories over the course of the project. In this EPD online initiative, mathematics, science, and technology teachers serving middle grade underrepresented student populations will earn Ambassadorships. Sixty educators will participate each year (for a total of 300 over the life of the project) in a series of 12-week online STEM Education courses and in doing so will become members of a dynamic online community of educators. As Ambassadors, participating teachers will serve as a STEM Education resource to other teachers in their communities and will promote the use of NASA resources and innovation instructional techniques in addressing the needs of all students. The first cohort of 23 Community Ambassadors representing 11 states began their programs in February and have now completed their initial course entitled “Methods of STEM Education: A Virtual Interactive Course with Culturally-Relevant Pedagogy for Upper Elementary-Middle School Educators” taught by Dr. Felicia Moore Mensah of Teachers College, Columbia University. Recruitment is currently underway for Cohort 2 that will include 40 teachers and will begin in late September.

Finally, EPDC also operates the EPDC Digital Badging System that is hosted by Pennsylvania State University's Center for Online Innovation in Learning (COIL). The EPDC Digital Badging System allows educators to earn badges as part of their ongoing personal professional development in many of NASA's STEM content areas. The badges can be converted into CEUs for certified teachers, earning the teacher's recognition from their employers and state teacher licensure boards.

The EPDC specialists are in the process of developing new badges as well as reviewing and revising many of the almost 90 existing NASA learning modules that were originally part of Teacher Learning Journeys program developed by NASA Aerospace Education Services Project (AESP) at Pennsylvania State University. This collaborative arrangement with Penn State to support digital badging is an example of how EPDC has been able to leverage existing NASA resources as well as develop new resources that feature the latest NASA developments and supplement curriculum areas, such as engineering education, where there were previously limited NASA education resources available. Discussions are also underway with various school districts that have expressed an interest in developing STEM
badges that can be hosted by EPDC and accessed by teachers and informal educators across the nation.

**Principle 5: Commitment to create an innovative national impact evaluation model that gets to the heart of professional learning and behavior change.**

In order to collect data necessary to complete reporting requirements from NASA Office of Education Performance Management (OEPM), to track participating educators across events and over time, and to establish a system through which educational research can be conducted, EPDC has implemented a comprehensive event management and evaluation system. The EPDC system uses an eTouches platform through which participants register for events and EPDC specialists submit their event reporting. Dr. James Van Overschelde coordinates EPDC’s evaluation and data reporting services and also serves as the primary interface between EPDC and OEPM.

The eTouches system collects and stores a variety of demographic data from participants so educators provide this information only once during their initial registration and are not asked to enter the information again on subsequent registrations. Following each EPD event, the system automatically sends participants an online evaluation survey through which participants provide feedback about the quality of the professional development, the effectiveness of the presenter, and the likelihood that they will implement the strategies and resources provided in the training. Once the survey is returned, the participant is sent a certificate documenting their participation and the number of hours completed that they can utilize for continuing education or district professional development credit.

A wide variety of reports can be generated through the eTouches system and provide real-time data on EPDC services and the characteristics of participating educators. This reporting capacity greatly facilitates the compilation of the monthly progress reports provided to NASA and MUREP Management. Further, the system allows EPDC and participating educators to have a record of all of the EPDC activities in which an individual
A few of the many research questions being investigated include:

1) Are face-to-face and online PDs equally effective at impacting teachers’ STEM attitudes and behavior?
2) Do participants’ perceptions of PD quality differ by delivery method?
3) Do the different sources of PD have equal impacts on teachers’ STEM attitudes and behavior?
4) What PD implementation strategies are the most successful and can these characteristics be incorporated into less successful PD to improve their success?

Activity FY 2015 Improvements (e.g., activity management, cost efficiencies) made in the past year

In its first year of operation, EPDC has achieved a number of key milestones that provide a solid infrastructure for leveraging NASA’s unique assets and resources to provide highly quality STEM-related professional development to the nation’s teachers and informal educators. Noteworthy among these accomplishments is building the exceptional team of STEM educators who comprise the EPDC educational specialists and forging strong working relationships with the 10 NASA Centers. In addition, the EPDC MSI Teacher Education Network partnership has been highly productive in developing resources and delivering professional development to better equip teachers to meet the needs of highly diverse student populations. EPDC is expanding our work with additional MSI through the Emerging Stars Network and with additional school districts through the School District Alliance.

EPDC online professional development offerings encompass a large portfolio of weekly webinars delivered by the EPDC educational specialists, online graduate course offerings in
STEM education delivered in partnership with US Satellite, and the newly launched NASA STAR (STEM Teacher Achievement and Recognition) Badging System through which teachers can earn digital badges in a variety of STEM content areas. EPDC staff has also launched a website and has successfully implemented a comprehensive event management and evaluation system that will greatly improve data reporting, evaluation and research efforts to investigate the effects of professional development on teacher practices.

As the EPDC leadership team looks to Year 2, a number of priorities have been identified, including:

- Expanding the offerings of the NASA STEM Badging System and expanding partnerships with school districts to ensure that the digital badges earned by teachers meet district and teacher needs and are valued and recognized by the districts.
- Continuing to build out the EPDC website so that it becomes a valuable resource to educators the “go to” place to learn about STEM PD opportunities and NASA resources for educators.
- Expanding our partnerships with additional MSIs and school districts to better serve the professional development needs of preservice and in-service educators and the university faculty who prepare teachers.

**Activity Partners and their Roles in Activity Execution**

NASA STEM EDPC has a number of partners that help operationalize the EPDC scope of work. Their involvement has been described in detail in the previous section on Activity FY15 Accomplishments. A recap of these partnerships and a brief summary of their primary roles are as follows:

Duclos Management & Consulting—provides coordination of the eTouches event registration system and corresponding reporting related to Quarterly progress
reports, annual reports, and OEPM reporting. Also assist with the oversight of the 10 EPDC specialists headquartered at the 10 NASA Centers.

**Penn State University**—houses and provides technical support to the EPDC Digital Badging System.

**U.S. Satellite**—provides credit-bearing online academic courses related to the Community Ambassadors Initiative.

**MSI Teacher Education Network universities**—partner universities that have identified faculty who engage in work that supports Culturally-Responsive STEM Education utilizing NASA resources. Currently, there are 8 universities that have MSI-TEN sub-awards.

**Emerging Stars Network**—An additional network of MSIs committed to enriching their STEM teacher preparation programs and value professional development in STEM Education for their faculty and students.

**EPDC School District Partnerships**—School districts that partner with EPDC to receiving ongoing NASA professional development specifically tailored for their district needs and priorities.
References

