NASA STEM EDUCATOR PROFESSIONAL DEVELOPMENT COLLABORATIVE (EPDC)

FY 2020 ANNUAL PERFORMANCE REPORT

FUNDING SOURCE:
OFFICE OF STEM ENGAGEMENT
MINORITY UNIVERSITY RESEARCH AND EDUCATION PROJECT
(MUREP)

MANAGING ORGANIZATION:
LANGLEY RESEARCH CENTER
OFFICE OF STEM ENGAGEMENT

ACTIVITY MANAGER:
GINA BLYSTONE
757-864-7855
GINA.R.BLYSTONE@NASA.GOV

ACTIVITY DESCRIPTION

NASA STEM Educator Professional Development Collaborative (EPDC) is a transformative, diversity-focused STEM educator professional development system with a national scope. EPDC was funded under the direction of the Minority University Research and Education Program (MUREP) through an initial $15 million five-year cooperative agreement, and extended through an additional 2-year cooperative agreement in 2019. EPDC provides a multitude of face-to-face and online professional development opportunities and NASA resources for educators in at the K-12 and university levels, STEM engagement opportunities for students of all ages, and informal STEM-related opportunities through a variety of community settings (www.txstate-epdc.net) .

EPDC utilizes NASA-unique resources to engage students and to provide standards-aligned professional development for formal and informal educators. Specifically, EPDC serves educators in a variety of roles including in-service teachers, preservice teachers, university faculty, and community educators working in a variety of contexts such as after school programs, summer camps and museums. EPDC professional development provides educators with the content knowledge and NASA resources needed to provide students with rigorous and engaging STEM learning opportunities that will inspire students and propel them toward future STEM careers. With EPDC specialists located at 8 of the 10 NASA Centers, EPDC offers high quality face-to-face professional development as well as synchronous and asynchronous online learning opportunities utilizing NASA-unique assets.

ACTIVITY GOALS

NASA STEM EPDC advances NASA's 2018 Strategic Objectives and Goal 1 of the 2018 Federal STEM Education 5-Year Strategic Plan put forth by the National Science and Technology Council's Committee on STEM Education. Specifically, these goals include:

- Advance understanding of Earth and develop technologies to improve the quality of life on our home planet. (NASA Strategic Goal 2).
- Improve STEM instruction by preparing 100,000 excellent new K-12 STEM teachers by 2020 and supporting the existing STEM teacher workforce (Committee on STEM Education Goal 1).

In support of the NASA Activity Goals, EPDC specifically has goals to:

- Impact STEM instruction nationwide though engaging, standards-aligned professional development and the utilization of NASA educational resources;
- Contribute to the research base related to the preparation and ongoing professional development of STEM educators and to investigate the impact of NASA's investment in education;
- Enrich educator learning by providing access to NASA-unique assets and innovative technologies; and
- Create powerful NASA partnerships with university, school district and community stakeholders.

ACTIVITY BENEFIT TO PERFORMANCE GOALS

FY 2020 OSTEM Performance Goals

OSTEM Performance Goal 3.3.3: Provide opportunities for students, especially those underrepresented in STEM fields to engage with NASA's aeronautics, space, and science people, content, and facilities in support of a diverse future NASA and aerospace industry workforce.

The NASA STEM EPDC offered a total of 571 professional development and STEM engagement events in FY 2020. Of the 571 events offered, 385 were online webinars for educators, 18 were online webshops for educators, 79 were face-to-face events for educators, 43 were face-to-face student engagements, and 22 were online student engagement webinars.

FY 2020, participants earned 178 digital badges through the EPDC Digital Badging System totaling 696.5 hours of credit. Since the inception of the EPDC Digital Badging System in February 2016, educators have earned a total of 3,581 digital badges, representing 26,008.5 hours of credit.

All professional development for educators were conducted with explicitly stated expectations that they would utilize their professional learning about NASA content and resources in direct connection to student learning; most educational credit for badges require that teachers provide evidence with deliverables such as lesson planning and/or instructional workshop that engaged students directly with NASA content.

OSTEM Performance Goal 3.3.4: Enhance the effectiveness of education investments using performance assessment and evaluation-driven processes.

The NASA STEM EPDC has implemented a comprehensive evaluation model that identified the specific delivery mechanisms through which individual educators receive NASA STEM engagement and professional development services, as well at the content topics, frequency, and duration of the activity in which they are engaging. After an event through which participants have registered online, they receive an online follow-up survey to allow them to evaluate the presenter, the quality of the experience, and their likelihood for integrating the NASA content and resources into their teaching. These evaluation data are then used to inform planning for future events and the use of project resources. All completed badges are evaluated by an EPDC specialist for participants' mastery of content.

OSTEM Performance Goal 3.3.5: Provide opportunities for students to contribute to NASA's aeronautics, space, and science missions and work in exploration and discovery.

EPDC specialists frequently promote and work with educators to encourage students participation in the NASA-sponsored design challenges. In addition, they sometimes support these efforts by helping to judge submissions, and helping to manage student visits to NASA Centers in relation to these competitions.

ACTIVITY ACCOMPLISHMENTS

By fostering awareness, engagement and understanding of NASA-unique content through professional development for educators, NASA STEM EPDC positively influences STEM curriculum the education

of students across the nation. EPDC provides an educational specialist who works on-site at 8 NASA Centers and provides both on-site and off-site professional development for educators within the vicinity of their assigned Centers. EPDC specialists also offer professional development at the national level through presentations and exhibits at key national conferences; they provide online professional development through a comprehensive set of culturally responsive webinar offerings and digital badges in STEM content areas that feature NASA content, activities and resources.

In addition, 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 rolesand advanced degrees. Special emphasis is also provided to those post-secondary 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.

EPDC utilizes 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 each role group. The NASA STEM EPDC program has also implemented a comprehensive evaluation model also captures data to determine which educators are receiving NASA professional development services through what specific delivery mechanisms, covered topics, frequency and duration of the professional development in which educators are engaging. After every online event, registered participans receive an online follow-up survey to allow them to evaluate the presenter, the quality of the experience, and their likelihood for integrating the NASA content and resources into their teaching; for face-to-face events, presenters initiative and send the followup survey to participants to complete. These evaluation data are then used by EPDC to inform planning and the use of project resources for future events and the use of project resources and provide NASA with important insights on how best to expend resources in educator professional development that will result in the desired impacts.

Professional Development Events: In FY 2020 EPDC sponsored various types of online professional development, expanding our offerings to adjust to current needs. These events have been wide spread and encompass all 50 states, the District of Columbia, Puerto Rico, and the US Virgin Islands. In FY 2020 NASA STEM EPDC delivered a total of 547 EPD events, including:

Online Webinars/Webshops: 425
Face-to-Face Workshops: 122

Below is a summary of the types of professional development events conducted over the six year period of performance for NASA EPDC.

PD/Engagement Events for Six Years of EPDC

PD Events by Type	Year 1 FY 2015	Yr. 2 FY 2016	Yr. 3 FY 2017	Yr. 4 FY 2018	Yr. 5 FY 2019	Yr 6 FY 2020	6-Year Total
Online EPD Webinar & Webshops	172	216	219	203	131	403	1,344
Face-to-Face PD Event	122	248	404	410	289	79	1,552
Online Student Webinars	-	-	-	-	-	22	22
Face-to-Face Student Events	-	-	-	-	-	43	43
Total events	294	464	623	613	420	547	2,961

Digital Badges: In addition, in FY 2020 the NASA STEM EPDC Digital Badging System awarded the following:

Digital Badges: 178
Representing: 696.5 hours of credit

As the chart below reflects, digital badge earned in FY 2020 were considerably higher than in FY 2019, the year in which EPDC badging system was being transitioned from Penn State University to Pensar Learning. This transition was necessary because EPDC wanted to add a Student Badging component to the system to create direct make opportunities for students as a result of the expanded scope of work included in the cooperative agreement executed in 2019. The addition of a Studet Badging component required additional security measures for minors that Penn State was unable to provide. This transition has now been successfully accomplished.

Digital Badges Earned

NASA Digital Badging System	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	6-Yr Total
Badges Earned		1,004	1,303	1,069	27	178	3,581
PD Hours Represented by Badges Earned		5,587	10,668	8,883	154	696.5	26,008.5

In looking at the 5-year history of the EPDC Digital Badging System, it should be noted that the large number of badges completed in FY 2016, 2017, and 2018 were primarily the result of participants in the MUREP Educator Institutes (MEI) being required to complete two badges as a pre-requisite for participation in MEI. The the substantial decrease in the number of badges completed in FY 2019 was the result of two factors—the discontinuation of MEI and the transition of the EPDC Badging System from one vendor to another in order to add a Student Badging component to the system.

Educators Served: EPDC staff and specialists provide professional development to educators through EPDC-sponsored events, events sponsored by the NASA Centers, and through other collaborative initiatives. The table below shows the educators served in FY 2020 by quarter by role group. It is important to note that the category of Informal Educators includes parents who are home schooling as well as educators working in informal settings such as museums, science centers, after school programs, and other community venues.

Quarter/ FY 2020	Elem. School Teachers	Middle School Teachers	High School Teachers	Pre-Service Teacher	Higher Ed. Faculty	Admins	Informal Educators	Students/ Other	Totals
Quarter #1	853	2,162	2,641	597	541	43	429	8,144	15,410
Quarter #2	660	992	787	222	303	34	395	7,636	11,035
Quarter #3	828	1,559	826	280	390	21	941	2,096	6,941
Quarter #4	882	1,631	1,279	318	271	37	1,273	5,258	10,949
Total FY	3,223	6,420	5,533	1,417	1,505	135	3,038	23,134	44,405

2020									

Educators Served for Six Years of EPDC

Level	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	6-Yr Total
Pre-Service	992	2,109	2,726	1,813	1,642	3,223	12,505
Elementary	2,047	6,653	10,542	6,283	4,784	6,420	36,729
Middle School	2,430	8,198	12,639	5,894	4,438	5,533	39,132
High School	1,140	4,367	7,813	4,672	3,686	1,417	23,095
Higher Education	1,765	1,189	3,412	2,137	1,269	1,505	11,277
Administrator	101	535	1,136	705	731	135	3,343
Informal Educators	982	1,638	3,186	2,490	1,746	3,038	13,080
Students/Other	114,798	9,520	23,855	27,569	49,641	23,134	248,517
Totals	124,255	34,209	65,309	51,563	67,937	44,405	387,678

EPDC Performance Summary: In each year of the cooperative agreement, EPDC greatly exceeded NASA's goal of reaching more than 10,000 educators per year in professional learning ranging from 1-40 hours in duration. In addition, EPDC served educators from all 50 states, the District of Columbia, Puerto Rico, and the US Virgin Islands. In the section below, EPDC's contribution to each FY 2020 Annual Performance Indicator (API) is further delineated.

ACTIVITY CONTRIBUTION TO ANNUAL SUCCESS CRITERIA

NASA Success Criteria 3.3.3 STEM-20-1: Meet or exceed the national average in two of the four categories of student diversity for NASA STEM enrollees in internships, fellowships, or other student engagement opportunities. Diversity Categories: (1) students across all institutional categories and levels (as defined by the U.S. Department of Education), (2) racially or ethnically underrepresented students (Hispanics and Latinos, African Americans, American Indians, Alaska Native, Native Hawaiians and Pacific Islanders), (3) women, and (4) persons with disabilities at percentages that meet or exceed national averages for science and engineering enrollees, as determined by the most recent, publicly available data from the U.S. Department of Education's National Center for Education Statistics.

EPDC Contribution: EPDC has an ongoing emphasis on serving communities with the highest need and providing opportunities and resources available to populations that have traditionally been underrepresented in STEM fields. For example, EPDC provided 5 specialized university-level student-webinars to include one national webinar in partnership with Univeristy of Georgia, North Carolina Association for Gifted and Talented, and Engged Education; EPDC specialists partnered to present a Talent Development webinar: "Promoting Scholar Identity and College-Competitiveness for High Achieving Black Students" to incude session on "Astronauts, Engineers, Scientist,and More: Student Opportunties with NASA". Specialists also conducted 3 "Lunch and Learn" webinars that focused on NASA opportunities aligned with the monthly webinar themes and that were culturally responsive to minorities and digital natives (Mar, Apr, May 2020) with topics: "Explore Solar System & Beyond: College STEM Students Utilize Mobile Apps & Digital Badges to Familiarize and Prepare Themselves for Opportunities with NASA"; "Explore Earth: Research & Virtual Poster Presentation Opportunities for College STEM Students, Recent Grads, and New Career Professional through NASA's DEVELOP National Program". Also included in the face-to-face student workshops included a face-to-face

workshop for Texas State's Society of Women Engineers (SWE) and high school students at the national conference for Society of Hispanic Professional Engineers.

In addition, EPDC has established more than 100 partnerships with Minority Serving Institutions (MSIs) across the nation through the EPDC Emerging Stars Network. Collectively, these partnerships involve more than 1,000 faculty who actively share NASA content and resources with the colleagues and students. For example, specialists met with faculty and administrators of University of West Georgia and Shelton State College (MSIs) to coordinate plans to conduct faculty workhops as a pilot for "Integrating Digital Badging and NASA Competition" into the STEM Classroom. As result of the canceled face-to-face 2020 trainings, faculty from across the country were able to attend the alternative training and webinar: "University Engagement: Integrating Digital Badging into STEM Curriculum" (April, 2020). The coordinating specialists developed and provided example syllabi for integrating micro-credentials into collegiate curriculum. This webinar was presented as part of a special 5-webinar EPDC University Educator Series: "Where is NASA Going? And How Do Universities Fit into that Journey" Series (Feb - May, 2020) in which presenting specialists organized and mailed "HBCU-NASA Information Packages" as part of pre-registration for identified MSI/HBCU participants.

MSI'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. The MSI Teacher Educator Network (MSI TEN) is comprised of STEM faculty members from Texas State University and fifteen partner universities that provide specialized expertise in the field of culturally responsive teaching in STEM. The MSI TEN faculty identify NASA curriculum activities that can be strengthened and develop new content for diverse student populations. They also revise undergraduate and graduate courses to include additional NASA resources and to emphasize culturally-responsive teaching.

NASA Success Criteria 3.3.4 STEM-20-2: Achieve milestone(s) in the implementation of performance assessment and evaluation of STEM engagement investments.

- **Milestone:** Award one competitive agreement to conduct a multi-year, third-party, project-level evaluation of the National Space Grant College and Fellowship Project.

Not Applicable to EPDC

NASA Success Criteria 3.3.5 STEM-20-3: Number of paper presentations and peer-reviewed research publications (and beginning in FY2021 to include student proposed solutions and products) resulting from STEM engagement investments.

- **Target:** 1300 paper presentations and peer-reviewed research publications resulting from STEM engagement investments

EPDC Contribution: EPDC supports this API through conference and webinar presentations, many of which include by information about higher education challenges, competitions, and internships. Upon request, EPDC can tailor an entire webinar to feature the specific challenge and competition and include the challenge/competition leads as co-presenters in the webinar presentation. EPDC has distribution lists of Minority Serving Institutions (MSIs) that are members of the EPDC Emerging Stars Network. This network includes 117 universities from 34 different states, the District of

Columbia, Puerto Rico, and the US Virgin Islands. Upon request, we have also distributed information about challenges, competitions and internships directly to these institutions.

Also, the EPDC Digital Badging System is a platform that can be used to support other NASA initiatives such as education challenges, competitions, and internships. For example, currently EPDC is conducting a series of online presentations specifically for MSIs. EPDC was also requested and lead the development of digital badges related to NASA M.U.S.I.C (MUREP Sustainability and Innovation Collaborative), a program designed to enhance MSI capabilities to competively respond to funding opportunities that support NASA's aeronautics, space and science missions. The M.U.S.I.C. badges are hosted on the EPDC Digital Badging System to be used and promoted by MUREP as a part of their MSI initiatives.

NASA STEM EPDC presents at a variety of professional conferences, with a special emphasis on conferences that serve populations that are under-represented in the STEM fields. NASA EPDC presented multiple sessions at each of the following 13 professional conferences during FY 2020:

Conference	***Date***	***Conference City***	***Presenter(s)***
NASA Small Business Annual Minority-University Networking Conference	*Sept. 17-18*	*Hunstville, AL*	*Kristina Collins (with Rod Chappel)*
American Indian Science and Engineering Society	*Oct. 10-12*	*Milwaukee, WI*	*Deepika Sangam & Michelle Berry*
Florida Association of Science Teachers	*Oct. 22-24*	*St. Augustine, FL*	*Samuel Garcia*
California Science Teachers Association	*Oct. 22-24*	*San Jose, CA*	*Sara Torres*
Society of Hispanic Professional Engineers Pre-Collegiate and Collegiate Conference	*Oct. 30-Nov. 2*	*Phoenix, AZ*	*Kristina Collins & Deepika Sangam*
Society for the Advance of Chicanos/Hispanics and Native Americans in Science	*Oct. 31-Nov. 2*	*Honolulu, HI*	*Araceli Ortiz & Sara Torres*
Science Teachers Association of New York State	*Nov. 2-4*	*Rochester, NY*	*Barbie Buckner*
Southeastern Regional Association of Teacher Educators	*Nov. 14-16*	*St. Augustine, FL*	*Leslie Huling & Virginia Resta*
Texas Conference for the Advancement of Science Teaching	*Nov. 21-23*	*Dallas*	*Michelle Berry, John Beck & Steven Smith*
Northern Illinois University STEAMing It Up Conference	*Jan. 16-17*	*Naperville, IL*	*Susan Kohler*
Space Exploration Education Conference (SEEC)	*Feb. 6-8*	*Houston, TX*	*Steven Smith, Araceli Ortiz, Leslie Huling, Michelle Berry, Deepika Sangam*
Association of Teacher Educators	*Feb. 15-19*	*Atlantic City, NJ*	*Leslie Huling, Barbie Buckner, Samuel Garcia*
Supporting the Emotional Needs of the Gifted (SEND) Mini-	*Feb. 28-29*	*Phoenix, AZ*	*Kristina Collins*

conference			

In addition, the leadership team and the EPDC specialists frequently publish their work in professional publications. EPDC also participates in the production of a "white paper" series in which various research efforts are highlighted and results are disseminated. Selected examples of these publications are as follows:

Huling, L. L., & Resta, V. K. (2020). A NASA/University faculty development partnership. *SRATE Journal, 29 (1*), 1-13.

Huling, L., & Resta, V. (In press). Cultivating a scientific mindset through inquiry-based science learning utilizing NASA Resources for Educators. In P. Short, H. Henson, & J. McConnel (Eds.). *Age of Inference: Cultivating a scientific mindset.* Information Age Publishing.

Collins, K.H. (2020). *2019 SHPE National Convention Pre-college Conference: SHPE SAILS (Students Advancing in Learning STEM) High school students' NASA awareness & self-perception metrics report.* LBJ Institute for STEM Education and Research, Texas State University. San Marcos, TX.

ACTIVITY IMPROVEMENTS MADE IN THE PAST YEAR

Increased interest in student badges as well as educator badges on the part of NASA and the educators we serve necessitated that we work through a variety of data security issues related to having K-12 students/minors on the digital badging platform. The EPDC Digital Badging System has been successfully transitioned from Penn State University to Pensar Learning in order to accommodate the security issues related to the offering of student badges. This move was made when it was determined that Penn State University was not able to accommodate K-12 students earning badges in their system.

EPDC has continued to expand our scope of services to incorporate more STEM engagement activities for students to better align with NASA's transition to the Office of STEM Engagement. Ongoing work has continued to provide digital training resources for the Next Gen STEM project and has resulted in both educator and student Next Gen digital badges on Moon to Mars; Small Steps, Giant Leaps; and the Commercial Crew Program. These badges are delivered through the EPDC Digital Badging System.

Internally, EPDC made alignments and reclassifications for the way EPDC specialists are classified as employees and are annually evaluated. Prior to this year, EPDC specialists were classified as Faculty of Practice but the typical evaluation measures and processes used for this role classification were not applicable to the EPDC specialist because of the unique features and demands of their role(s). As a result, EPDC had developed and implemented an evaluation process that was more in alignment with the duties of the EPDC specialist role. During the summer of 2020, in coordination with the Texas State HR department, it was decided that a staff role assignment was more appropriate for the EPDC specialists and these positions were reclassified as grants specialists which is a staff role assignment. This switch necessitated that EPDC specialist now be evaluated through the staff performance evaluation system. To provided ongoing relevant data toward this evaluation, a monthly goals reporting form was developed and specialists submit this completed form to the EPDC management

team on a monthly basis. These monthly reports will be utilized in combination with other measures to complete the annual evaluation.

ACTIVITY PARTNERS AND ROLE OF PARTNERS IN ACTIVITY EXECUTION

NASA STEM EDPC has a number of partners that help operationalize the EPDC scope of work. A brief summary of their primary roles are as follows:

- **The Emerging Stars Network** members consist of 117 Minority Serving Institutions (MSIs) that sent teams of pre-service teachers and faculty sponsors to the week-long MUREP Educator Institutes conducted at each of the 10 NASA Centers during the summers of 2016, 2017 and 2018. . Through these partnerships, EPDC specialists frequently provide online and face-to-face professional development for the Emerging Stars institutions. Emerging Stars faculty also integrate NASA resources into their teacher preparation courses and disseminate information about various NASA opportunities to their students and fellow faculty members.

- **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, 8 of whom are headquartered at the NASA Centers.

- **Pensar Learning** provides the digital badging platform that hosts the NASA STEM Digital Badging System that allows educators to earn badges as a part of their ongoing professional development in many STEM content areas aligned to NASA Missions. The Student Badging component was also added in 2019 and was the primary reason that the Badging System was transitioned from Penn State University to Pensar learning. Educators can convert their badge credit into CEUs, allowing them to receive professional recognition from their employers and state teacher licensure boards. Pensar's leadership team members are experts in Cognitive Science, Machine Learning, Big Data and Educational Technology bringing together an unprecedented ability to predict and transform learning at scale.

- **EPDC School District Partnerships**—School districts that partner with EPDC to receiving ongoing NASA professional development specifically tailored for their district needs and priorities. Examples of this type of tailored professional development include the development of badges specifically for Houston ISD teachers, and working with Virginia City Schools in their classroom implemention of EPDC's Camp in a Box.

REFERENCES

Committee on STEM Education of the National Science and Technology Council, (2013). *Coordinating federal STEM-education investments: Progress report.* Retrieved from *http://www.whitehouse.gov/sites/default/files/microsites/ostp/stem_stratplan_2013.pdf*

Executive Office of the President, O. of S. and T. P. (2018). Charting a Course for Success: America's Strategy for STEM Education. A Report by the Committee on STEM Education of the National Science & Technology Council. In Executive Office of the President. Executive Office of the President.

National Aeronautics and Space Administration. (2018). NASA Strategic Plan 2018. Washington, Dc: NASA Headquarters. *https://www.nasa.gov/sites/default/files/atoms/files/nasa_2018_strategic_plan.pdf*

National Science Foundation. (2010). Preparing the Next Generation of Stem Innovators Identifying and Developing Our Nation's Human Capital. Nsb-10-33. ERI

President's Council of Advisors on Science and Technology. (2012). *Engage to excel: producing one million additional college graduates with degrees in Science, technology, engineering, and mathematics.* Retrieved from http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-engage-to-excel-final_feb.pdf