



NASA STEM ENGAGEMENT & EDUCATOR PROFESSIONAL DEVELOPMENT COLLABORATIVE (EPDC)

FISCAL YEAR 2021 ANNUAL PERFORMANCE REPORT (APR)

FUNDING SOURCE:

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

MANAGING ORGANIZATION:

LANGLEY RESEARCH CENTER
OFFICE OF STEM ENGAGEMENT

ACTIVITY MANAGER:

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ENGAGEMENT ACTIVITY/PROGRAM DESCRIPTION:

NASA STEM Engagement & 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, extended through a series of additional cooperative agreements funded through February 28, 2023. 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.

ENGAGEMENT ACTIVITY/PROGRAM GOALS:

NASA STEM Engagement & Educator Professional Development Collaborative project adopts *all three OSTEM goals as its overarching project goals:*

- Strategic Goal 1: Create unique opportunities for a diverse set of students to contribute to NASA’s work in exploration and discovery
- Strategic Goal 2: Build a diverse future STEM workforce by engaging students in authentic learning experiences with NASA’s people, content, and facilities
- Strategic Goal 3: Attract diverse groups of students to STEM through learning opportunities that spark interest and provide connections to NASA’s mission and work

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

- Impact STEM instruction nationwide through 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.

**ENGAGEMENT ACTIVITY/PROGRAM CONTRIBUTIONS TO PERFORMANCE GOALS
(PG) AND SUCCESS CRITERIA**

PG 3.3.3: Provide opportunities for students to engage with NASA’s aeronautics, space, and science people, content, and facilities in support of a diverse future NASA and aerospace industry workforce.

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

PG 3.3.5: Provide opportunities for students to contribute to NASA’s aeronautics, space, and science missions and work in exploration and discovery.

Success Criteria: Percentage of higher education significant awards in four categories of student diversity for NASA STEM enrollees for both virtual and in-person higher education engagement activities. 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.

FY 2021 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 812 professional development and STEM engagement events in FY 2021. Of the 812 events offered, 541 were online webinars for educators, 74 were online webshops for educators, 14 were face-to-face events for educators, 10 were face-to-face student engagements, and 138 were online student engagement webinars.

FY 2021, participants earned 453 digital badges through the EPDC Digital Badging System totaling 1595.5 hours of credit. Since the inception of the EPDC Digital Badging System in February 2016, educators have earned a total of 4,034 digital badges, representing 27,604 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 as 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.

ENGAGEMENT ACTIVITY/PROGRAM 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 roles and 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 participants 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 initiate and send the follow-up 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 2021 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 2021 NASA STEM EPDC delivered a total of 812 EPD events, including:

Online Webinars/Webshops: 753

Face-to-Face Workshops/Conferences: 59

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

PD/Engagement Events for Seven 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	Yr. 7 FY 2021	7-Year Total
Online EPD Webinar & Webshops	172	216	219	203	131	403	615	1,959
F-2-F PD Event/Conf.	122	248	404	410	289	79	49	1,601
Online Student Webinars	-	-	-	-	-	22	138	160
Face-to-Face Student Events	-	-	-	-	-	43	10	53
Total events	294	464	623	613	420	547	812	3,773

Digital Badges: In addition, in FY 2021 the NASA STEM EPDC Digital Badging System awarded the following:

Digital Badges: 453
Representing: 1,595.5 hours of credit

As the chart below reflects, digital badge earned in FY 2021 were considerably higher than in FY 2020. In 2019, the EPDC badging system was transitioned from Penn State University to Pensar Learning. This transition was made 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 Student Badging component required additional security measures for minors that Penn State was unable to provide.

Digital Badges Earned

NASA Digital Badging System	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	6-Yr Total
Badges Earned		1,004	1,303	1,069	27	178	453	4,034
PD Hours Represented by Badges Earned		5,587	10,668	8,883	154	696.5	1595.5	27,604

In looking at the 6-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. FY 2019 showed a marked decrease in badges earned once MEI was completed, but since this point badges earned have steadily increased from 2019 to present.

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 2021 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 2021	Elem. School Teachers	Middle School Teachers	High School Teachers	Pre- Service Teacher	Higher Ed. Faculty	Admins	Informal Educators	Students/ Other	Totals
Quarter #1	1,953	1,408	1,030	218	335	249	881	48,171	54,245
Quarter #2	1,181	1,559	958	157	280	217	830	6,437	11,619
Quarter #3	1,108	1,134	652	147	260	205	651	15,699	19,856
Quarter #4	510	1,378	710	186	172	28	410	32,681	36,075
Total FY 2020	4,752	5,479	3,350	708	1,047	699	2,772	102,988	121,795

Educators Served for Seven Years of EPDC

Level	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	7-Yr Total
Pre-Service	992	2,109	2,726	1,813	1,642	3,223	708	13,213
Elementary	2,047	6,653	10,542	6,283	4,784	6,420	4,752	41,481
Middle School	2,430	8,198	12,639	5,894	4,438	5,533	5,479	44,611
High School	1,140	4,367	7,813	4,672	3,686	1,417	3,350	26,445
Higher Education	1,765	1,189	3,412	2,137	1,269	1,505	1,047	12,324
Administrator	101	535	1,136	705	731	135	699	4,042
Informal Educators	982	1,638	3,186	2,490	1,746	3,038	2,772	15,852
Students/Other	114,798	9,520	23,855	27,569	49,641	23,134	102,988	351,505
Totals	124,255	34,209	65,309	51,563	67,937	44,405	121,795	509,473

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 5 professional conferences during FY 2021:

Conference	Date	Conference City	Presenter(s)
Society for Information Technology & Teacher Ed.	Mar. 10, 2021	Virtual	Huling & Resta
Afterschool for Children & Teens Coalition (ACT) Conference	April 7, 2021	Virtual	Kohler

National Council for the Teaching of Mathematics (NCTM)	Sept. 22-25, 2021	Atlanta, GA	Buckner
American Indian Science & Engineering Society (AISES) National Conference	Sept. 23-25, 2021	Phoenix, AZ	Torres & Uribe
International Girls in Aviation Day	Sept. 25, 2021	Virtual	Weiss

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 produced in FY 2021 are as follows:

Collins, K.H., Price, E., Hanson, L. & Neaves, D. (2020). Consequences of stereotype threat & imposter syndrome in STEM: The journey from STEM-professional to STEM-educator for four women of color. *Taboo: The Journal of Culture and Education*, 19(4), 161-180. <https://digitalscholarship.unlv.edu/taboo/vol19/iss4/10>

Huling, L., & Resta, V. (2021). 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.

Huling, L. . & Resta, V. K. (in press). The capstone experience: A valuable tool in promoting teacher development. In *The Educator Continuum and Development for Teachers*. Hershey, PA: IGI Global.

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 2021. Annual Performance Indicator (API) is further delineated.

ENGAGEMENT ACTIVITY/PROGRAM IMPROVEMENTS MADE IN THE PAST YEAR:

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.

In 2020 EPDC transitioned the educational specialists to a grant specialist staff role from a Faculty of Practice role because the traditional evaluation criteria for Faculty of Practice positions were not well-aligned with EPDC specialist duties. EPDC has now developed and implemented an evaluation process that is more in alignment with the duties of the EPDC specialist role. 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.

ENGAGEMENT ACTIVITY/PROGRAM 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 implementation of EPDC’s Camp in a Box.

REFERENCES (optional – include only if needed):