ANNUAL PERFORMANCE REPORT
JUNE 1, 2019 – MAY 31, 2020

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Cooperative Agreements
(80NSS17M0021, 80NSS17M0022, 80NSS17M0023, and 80NSS17M0024)
2019-2020 has been an exciting year of engagement with NASA events. Through the Artemis program, two of our activities (Micro-g NExT and NASA SUITS) have been designated as Artemis Challenges, and our staff have contributed to the Astronaut Candidate graduation and SpaceX Demo-2 of the Commercial Crew Program to launch American astronauts from American soil in an American spacecraft for the first time in nine years.

This third year of NSPACE also offered our team the opportunity to embrace innovation and creativity in the design and development of unique learning experiences that serve to inspire, engage, educate and employ the next generation of explorers. Nationwide closures forced cancellation of some face-to-face activities (MITTIC, MIRO, NCAS: NASA on Campus) and postponement of other activities until Fall 2020 (WEAR, NASA/Texas Instruments Code Challenge, Space Grant Consortium training opportunities, NCAS Legacy, faculty training for NCAS: NASA on Campus). The adjustment of submissions facilitated continuation of activities (SPOCS and In-flight Education Downlinks), and an investment in enhanced digital resources and experiences served to strengthen existing activities (CCP digital Launch Kit, SUITS, HUNCH, NCAS). In essence, this year has been marked with the challenge of not being able to provide STEM engagement experiences exactly how we have in the past but also with the exciting adventure of creating new ways to engage learners.

NSPACE has reached more than 155,000 students this year, a feat that could only be accomplished with the amazing team of professionals who work tirelessly to implement excellence throughout our activities. We are pleased to have added 14 new NSPACE employees across the nation and enjoyed having the team on the Oklahoma State University campus for a week in November 2019 for a Professional Development Leadership Summit featuring expert researchers in STEM education, engineering, online teaching and learning, team building and reaching and serving underrepresented populations. NSPACE staff are taking advantage of tuition waivers for their own graduate education as well as for their dependent undergraduate students. Our NASA STEM Engagement Community of Practice in Canvas, our learning management system, facilitates continual professional development and collaboration for NSPACE employees.

Along with our partners – the 13-campus Texas A&M University system, 4-H, the Center for Sovereign Nations, Langston University and Northern Oklahoma College – we are proud to leverage emerging technologies and innovative pedagogies to transform the challenges of the COVID-19 pandemic into opportunities that strengthen our activities. The highlights of each activity on the following pages will give you a glimpse of the impact of this important work.

— Dr. Stansberry
Professor, Educational Technology
PI, NASA STEM Pathway Activities – Consortium for Education (NSPACE)
Founder, Emerging Technologies and Creativity Research Lab

Growth, Change and Innovation
NSPACE Activities fall under one of two categories — **STEM Collaborations**: Activities in collaboration with partners, including school districts, State of Texas, Houston Livestock & Rodeo and the International Space Station Office; or **STEM Operations**: Activities funded by the Minority University Research and Education Projects (MUREP), NextGen STEM (NGS) and the National Space Grant College and Fellowship Project (Space Grant).

education.okstate.edu/nasa

**STEM COLLABORATIONS**

6  HAS  High School Aerospace Scholars
8  HISD  Houston Independent School District Aerospace Academies
10  HUNCH  High schools United with NASA to Create Hardware
12  Micro-g NExT  Microgravity Neutral Buoyancy Experimental Design Teams
14  NASA SUITS  NASA Spacesuit User Interface Technologies for Students

**STEM OPERATIONS**

16  CCP  Commercial Crew Program
18  MITTIC  MUREP Innovation Tech Transfer Idea Competition
20  MIRO  MUREP Institutional Research Opportunity
22  MOO  MUREP Other Opportunities
22  MSI  MUREP Sustainability Initiative
24  NCAS Legacy  NASA Community College Aerospace Scholars
26  NCAS: NASA on Campus  NASA Community College Aerospace Scholars
28  SOS  STEM on Station
30  WEAR  STEM Challenge
Added 14 new full-time team members to NSPACE

Working on 13 activities for NASA’s Office of STEM Engagement

98% of the NSPACE team attended the Professional Development Summit held at Oklahoma State University

Coordinated onsite experiences at 10 NASA centers and three offsite locations; reaching 155K participants from 49 states and territories

Enhanced organization structure providing team members greater access with 7 leads

Above and beyond supporting 6 Apollo 50th Events

9 employees seeking or recently completed an advanced degree

All working together to engage, educate and inspire the ARTEMIS GENERATION
Social Feed

**Social Feed**

Enjoyed my time with #NASASUITS teams yesterday talking about the challenges of space walking. Smart questions lead to innovative breakthroughs! Your efforts are going to fuel #Artemis exploration of the moon.

What's for dinner? As part of the @NASAHUNCH program, these high school students are using their culinary skills competitively as they aim to create the best new dish for astronauts aboard the @Space_Station. Opening their minds to new careers and possibilities along the way.

Watch these teens present 'zero-gravity' dishes for astronauts in space!

**Anonymous quotes found in this report are from a third-party evaluation report. Any names withheld are to protect participant privacy.**
**High School Aerospace Scholars** is a unique experience beginning with a 16-week online, interactive course on NASA activities related to space exploration, Earth science, technology, mathematics and aeronautics. Texas high school juniors complete design challenges and attend monthly webinars with NASA scientists and engineers who have a direct impact on the Artemis program. Achieving students are invited to a six-day residential summer experience at NASA’s Johnson Space Center, where they work with a team of like-minded peers and NASA experts on designing a mission to Mars and engineering design challenges.

www.nasa.gov/has

**AUDREY SCOTT, HAS participant**

Just had a talk from Norm Chaffee, an engineer with decades of experience at JSC. He worked on Saturn V, particularly with propulsion and thrusters. He went on to become manager of Lunar and Mars Exploration.
HAS
BY the NUMBERS

Students represented
248 cities and 432 institutions throughout the state of Texas

41% of online students were female

1,148 Students enrolled in the online course, an increase of 370 students from last year

30% of online course participants were from Title 1 schools

264 students participated in 6 onsite visits in June and July 2019

33% of online course participants were of Hispanic ethnicity

Increase student participation in HAS onsite experience by creating an innovative, Artemis-themed, gamified, virtual summer experience for all students who finished the HAS online course

Develop partnership with Texas A&M University in support of STEM initiatives

Support more diversified student pools, exposing more demographics to NASA STEM activities
Houston Independent School District Aerospace Academies supports five schools in HISD receiving a grant from the U.S. Department of Education to become STEM magnet schools involving programs focusing on aerospace engineering. The HISD Aerospace Academies activity provides content, resources and instructional coaching to aid educators in training the Artemis generation of space explorers.

WESLEY ELEMENTARY SCHOOL

Congrats to the #NewAstronauts of the graduating XXII. Wesley was glad to play a part in this celebration of those that will be the #Artemis Generation pioneers of space exploration to come, to the Moon & Mars we go.
HISD
BY the NUMBERS

4,000+ students served over 5 campuses in the 7th largest school district in the nation

98% of students from populations historically underrepresented in STEM

“Having a partnership with NASA has given me a sense of pride and brought a new light to my profession. It allows me to get away from teaching to the test and more on real world applications.”

— educator

94% economically disadvantaged students

Monthly lunchtime STEM Challenges

376 NASA science lessons shared across 7 grade levels (K, 1, 3, 6, 7, Biology, Chemistry) in the first two years

40+ teachers supported by NASA Instructional Coaches with lesson planning, in-class modeling and unique access to NASA subject matter experts

Two Aerospace Academy high schools participate in HUNCH

In-flight Education Downlink connecting Wesley Elementary School and Washington High School students with astronauts on the International Space Station

Washington and Milby High School students launch rockets traveling faster than the speed of sound with SystemsGo

Congrats to the #NewAstronauts of the graduating class of XXII. Wesley was glad to play a part in this celebration of those that will be the #Artemis Generation pioneers for space exploration to come, to the Moon & Mars we go.

FORWARD to the MOON

HISD
class of inhabitants thinkers for we go.
High schools United with NASA to Create Hardware partners students, NASA and industry to create real products meeting NASA needs and standards. Students across the nation participate in precision machining, industrial sewing, design-and-prototyping, culinary science and video challenges under the guidance of NASA and industry mentors.

www.nasahunch.com

Students work in the maintenance lab installing engines, refurbishing a #NASAHUNCH model and putting together storage lockers for the #InternationalSpaceStation
HUNCH has delivered hundreds of projects to NASA this year, including:
- 600 spacewalk wire ties,
- 177 design developments for flight,
- 131 softgoods,
- 25 lockers,
- 2 prototypes for flight,
- 1 culinary item

Nearly 300 student teams developing new prototypes for space exploration

21 industry partners

74 videos submitted from 27 schools about living and working on the moon and beyond

DELIVERED 800+ flight products with 20,000+ individual parts and components to NASA since 2003

Partnered with 277 schools in 38 states and 2 US Dept. of Defense schools in Belgium and Puerto Rico: working with 2,500+ students and 230 educators

More Gateway and Orion projects to support the Artemis mission. Students are also producing trainer parts for Artemis mission mockups

Growing software program and finding industry partners for mentorship

Mentoring and facilitating more student hardware and softgoods assembly for flight and training items
Micro-g Neutral Buoyancy Experiment Design Teams is a mission-driven, authentic NASA STEM experience. This Human Exploration and Operations Mission Directorate collaboration with the Office of STEM Engagement (OSTEM) integrates undergraduate students into the technology and hardware development paths of NASA missions in support of human space exploration.

https://go.nasa.gov/mgnext

COLUMBIA UNIVERSITY, Micro-g NExT

After a year of hard work designing a sharp-edge detection & removal device for @NASA_Astronauts to use on future missions, the @Columbia MicrogNExT team had a great time successfully testing their spacewalk tool with @NASA_Johnson at the Neutral Buoyancy Lab last week!
Micro-g NExT
BY the NUMBERS

SIX team leads and 24% of online participants are female

33% INCREASE in teams from Minority Serving Institutions compared to 2018

1 of 6 OSTEM Artemis Challenges

Zip tie cutter from Lone Star College-Cy Fair used in TWO spacewalks!

28 teams from 14 states participated online and 7 successful teams tested tools at NASA’s Neutral Buoyancy Lab (NBL)

FORWARD to the MOON

New collaboration with the Search and Rescue Office at NASA’s Goddard Space Flight Center

5 new challenges in support of Artemis II and Artemis III

Will utilize the Lunar Operations Training portion of the NBL, increasing the use of a NASA-unique facility

Micro-g NExT Team

The detection on future a great week!
NASA Spacesuit User Interface Technologies for Students challenges students to design and create spacesuit information displays within augmented reality environments. As NASA pursues Artemis, the agency accelerates investing in surface architecture and technology development. For exploration, it is essential crewmembers on spacewalks are equipped with the appropriate human-autonomy enabling technologies necessary for the elevated demands of lunar surface exploration and extreme terrestrial access.

http://go.nasa.gov/nasasuits

Enjoyed my time with #NASASUITS teams yesterday talking about the challenges of space walking. Smart questions lead to innovative breakthroughs! Your efforts are going to fuel #Artemis exploration of the moon.
NASA SUITS

BY the NUMBERS

450+ students and faculty engaged

18+ NASA subject matter experts

48% new institutional engagement

33% of institutions were minority serving, with the first ever Tribal College and University Team

1 of 6 OSTEM Artemis Challenges

150+ students from 21 institutions in 15 states participated in NASA SUITS online community

FORWARD to the MOON

NASA’s Joint Augmented Reality Visual Informatics System project is incorporating ideas from student interfaces into the design for the new Artemis spacesuit

Navigation features included in student designs in preparation for Artemis missions
As NASA makes strides to return human spaceflight on American spacecraft from American soil, Commercial Crew Program Next Gen STEM focuses on releasing resources amplifying STEM engagement. Virtual reality tours, workshops and resource kits engage students and educators in this profound moment in American history as Boeing completed their Orbital Flight Test and SpaceX launched with NASA astronauts from the United States for the first time since 2011.

https://www.nasa.gov/stem/ccp

It feels great to be supported as an educator! Less than 4 hours to launch! #Starliner #NASASocial @SSESFalcons #iteachphysics
CCP
BY the NUMBERS

6 360° virtual reality field trips released with 41,000+ views

8,000+ students reached at Naval Air Station Oceana Air Show

23,000+ students engaged in CODing Simulation at Microsoft stores across the nation

Interacted with 4,000 participants attending the International Society for Technology in Education conference

128 preservice teachers participated in SOS workshops with CCP content

“So enthusiastic and engaging! Very excited to see all of the amazing new resources for educators to use in their classrooms.”
— educator

FORWARD to the MOON

Provide professional development opportunities and experiences for the Space Grant Consortium

Create STEMonstrations with Boeing astronaut Chris Ferguson and Boeing Education
MUREP Innovation and Tech Transfer Idea Competition is a spinoff challenge established to develop new ideas for commercialization and Artemis deep space exploration missions by seeking concept papers from multidisciplinary student teams enrolled at a Minority Serving Institution (MSI).

go.nasa.gov/nasamittic

MITTIC is an opportunity to develop leadership skills, work with NASA technologies, and create an innovation to help society.
MITTIC

BY the NUMBERS

43% of participating institutions are Historically Black Colleges and Universities (HBCU) and 54% are Hispanic-Serving Institutions

55% of teams partnered with a NASA Small Business to develop concept

9 MITTIC interns at NASA’s Ames Research Center in summer 2019

2 teams from MITTIC 1.0 received seed funding to continue development of a prototype

First ever HBCU White House Initiative Scholar Mini-MITTIC sessions with 44 Scholars

“MITTIC gives you a way to critically think, in a fun way, while learning and getting first-hand knowledge about NASA technologies.” — student participant

FORWARD to the MOON

Increase Artemis-related intellectual property options for creating student concepts

Incorporating business coaching 101 mentorship for all teams

Add curriculum development of Concept to Commercialization
MUREP Institutional Research Opportunity awards strengthen and develop the research capacity and infrastructure of Minority Serving Institutions (MSIs) directly supporting NASA’s four mission directorates—Aeronautics Research; Science; Space Technology; and Human Exploration and Operations. MIRO university research allows NASA to tap into the Artemis Generation for new expertise and innovative new ideas, expanding research and development talent base for missions to the Moon and Mars.

https://www.nasa.gov/stem/murep/projects/miro.html
“I have never really enjoyed school, never really wanted to be bothered with it, but since working with this program I am actually excited about the prospect of graduate school, and thinking I could handle it. I would be great there and flourish.”

– student participant

The University of Texas at San Antonio will research data measurement techniques for use during atmospheric entry of extraterrestrial surfaces to help NASA’s Artemis mission.

Research at the University of Puerto Rico, Rio Piedras, will enable long-duration missions to the Moon and Mars.
MUREP Other Opportunities engages and inspires the Artemis generation through strengthening curriculum and curricular pathways in STEM. MOO attracts, retains and supports the success of underrepresented students in STEM degree programs.

The MUREP Sustainability Initiative supports capacity building increasing long-term sustainability at Minority Serving Institutions (MSIs) by creating awareness of opportunities including grants and cooperative agreements but significantly increasing contracting opportunities in partnership with NASA’s Offices of Procurement, Small Business Programs, Technology Transfer, Small Business Innovative Research, Small Business Technology Transfer and Space Act Agreements. NASA has a 1% contracting goal for MSIs which builds research enterprises developing a more diverse STEM workforce.

https://www.nasa.gov/stem/murep
**MOO BY the NUMBERS**

<table>
<thead>
<tr>
<th><strong>100%</strong> Minority Serving Institutions</th>
<th><strong>3,000+</strong> students reached with summer camps and after-school programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>20+ college STEM courses revised or created</td>
<td>17 NASA paid internships in summer 2019</td>
</tr>
<tr>
<td>NASA’s Goddard Space Flight Center and Ames Research Center worked directly with students for <strong>four years</strong> to conduct research</td>
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**FORWARD to the MOON**

- Increasing engagement with NASA mission directorates at all centers
- Preparing for White House Initiative Conference for HBCUs, NASA Technology Infusion Road Tour and Case Summit
- Deeper dive with HBCUs and TCUs increasing participation in more MUREP platforms

**MSI BY the NUMBERS**

<table>
<thead>
<tr>
<th><strong>7,000+</strong> students, educators and staff reached</th>
<th><strong>114</strong> Historically Black Colleges and Universities (HBCUs) reached</th>
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</thead>
<tbody>
<tr>
<td><strong>12</strong> institutional engagement activities involving <strong>204 Minority Serving Institutions</strong></td>
<td><strong>23</strong> Asian American and Pacific Islander Serving Institutions reached</td>
</tr>
<tr>
<td><strong>48</strong> Hispanic-Serving Institutions reached</td>
<td><strong>13</strong> Tribal Colleges and Universities (TCUs) reached</td>
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</tbody>
</table>

174 Historically Black Colleges and Universities (HBCUs) reached

13 Hispanic-Serving Institutions reached

23 Asian American and Pacific Islander Serving Institutions reached

13 Tribal Colleges and Universities (TCUs) reached
NASA Community College Aerospace Scholars engages the nation in NASA’s mission by helping students in the Artemis generation make the connection between a STEM degree and career opportunities; engaging them in NASA’s six research and exploration themes; and motivating students to participate in other NASA challenges, research opportunities, and internships. NCAS is funded by MUREP and encourages community college students to finish their two-year degree and pursue a four-year degree or career in a STEM field.

https://go.nasa.gov/ncas

My tiny glimpse into @NASA through #NCAS2019 has encouraged me to dream bigger and reach further. Never in a million years would I have considered something like this before.
Created with community college students in mind, the redesigned website is easier to navigate and has the look and feel of a modern NASA activity website.

To bring awareness of all 10 NASA centers, the online course will integrate how each center contributes to the current and future missions.

NCAS Legacy
BY the NUMBERS

“I couldn’t have asked for a better team, nor a better mentor. My week at NASA Wallops was the best week of my life and the most life changing!”
 — student

57% of students identified as a member of a minority group

72% of students came from MSIs

1,371 students participated in the online course

“After these 4 days of work and little sleep, I left JPL with a brighter view of my future and loads of amazing advice in my toolbox! Truly thankful for this opportunity!”
 — student

1,243 students from 274 community colleges in 42 states invited to 20 onsite events at all 10 NASA centers

#NCAS2019 and reach all I have now.

FORWARD to the MOON

Participant

My tiny glimpse into @NASA through #NCAS2019 has encouraged me to dream bigger and reach further. Never in a million years would I have considered something like this before now.
NASA Community College Aerospace Scholars: NASA on Campus takes the successful NCAS Legacy model implemented at NASA centers and trains community college faculty to achieve the same positive student outcomes on their local campus. NCAS: NASA on Campus opens doors for two-year community college students seeking a STEM degree. Students get a closer look at NASA’s unique missions and research and learn how to develop their talents, interests and passion to become future STEM professionals. NCAS is a blended-learning experience comprised of a five-week online course and a four-day, on-campus engineering design and robotics competition.

https://go.nasa.gov/ncas-campus

ASHLYNN NORRIS, NASA on Campus participant

The #NCAS2019 experience for me was breathtaking, reaffirming, and incredible. I hope that every single student that has #space on the mind looks to #NASA and explores their opportunities.
NCAS: NASA on Campus

BY the NUMBERS

24 mentors including industry volunteers from **Boeing, Disney** and the **Federal Drug Administration**

Hired **3 instructional coaches** to support campus faculty

**300** hours of training for faculty, including **onsite preview, online facilitation** and **NCAS co-facilitation and implementation**

**Funded 6 NASA internships for NCAS: NASA on Campus alumni**

**Funded 6 events at community college campuses**

Comparable impact data to the NCAS Legacy model, **indicating success** in the franchise model

Opening a solicitation through Space Grants to offer 11 minority-serving community colleges across the nation the opportunity to receive funding to implement NCAS

Tier II activities to offer campus participants a chance to visit a NASA center and participate in new technical engineering design challenges
With nearly 20 years of continuous human presence, the International Space Station remains the sole space-based proving ground for reaching the Moon in 2024 with the Artemis program. **STEM on Station** uses the International Space Station, its crew and the onboard research to inspire, engage and educate students and educators. SOS advances the nation’s STEM education and workforce pipeline through a comprehensive website of resources, conversations with astronauts in space, lessons taught from the space station and hands-on STEM activities developed through high-profile partnerships leveraging NASA’s mission and unique assets.

www.nasa.gov/stemonstation

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**ALLISON KAPITANOFF, educator**

#Teachers! Friends! Countrymen! THIS IS NOT A DRILL! @NASASTEM #STEMonstration videos are one of the coolest ways to support #STEM and #Science instruction I have come across…and I work in edtech! @NASA #STEMonStation @Space_Station @NASA_Johnson
SOS
BY the NUMBERS

20 In-flight Education Downlinks, reaching 78,000+ participants

On a scale of 10, student participants ranked before and after the downlink:

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
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<tbody>
<tr>
<td>Awareness of NASA’s work</td>
<td>4.2</td>
</tr>
<tr>
<td>Interest in STEM</td>
<td>5.5</td>
</tr>
<tr>
<td>Confidence in STEM ability</td>
<td>5.3</td>
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300,000+ views of STEMonstrations

22 teams submitted letters of intent for the Student Payload Opportunity with Citizen Science (SPOCS)

59% of downlinks served schools and organizations with majority participants representing underserved populations

6,000+ virtual reality tours of the space station at Apollo 50th Festival in Washington D.C.

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FORWARD to the MOON

In the NASA/TI Codes Challenge, students will use Texas Instruments technology and SOS resources to develop solutions improving life for astronauts on the space station

SPOCS will continue accepting student proposals for five student payloads to fly to and return from the space station through Nanoracks and DreamUp
The WEAR STEM Challenge is an engineering design challenge where NASA presents problems about wearable technologies to middle and high school students, seeking contributions to deep-space exploration missions. WEAR focuses on wearable technologies aiding crewmembers and others in tasks such as monitoring conditions, protecting organs and collecting data. This year WEAR challenged the Artemis Generation to design wearable radiation countermeasures for deep space exploration.

https://go.nasa.gov/NASA_WEAR

Our #NASA_Wear team shared their passion about #NASARadworks at our Freshman Preview Night with about 1000 8th graders and their parents.
WEAR
BY the NUMBERS

Team outreach to **16,000+ K-12 students and 26,000+ community members**

2 million+ people reached through social media using #NASA_WEAR

"It is a real challenge - meaning it is messy, somewhat ‘fuzzy’ and open to student creativity. Amazing experience for students to do real science."

— educator

288% increase in design proposal submissions compared to last year

66 teams completed design submissions representing 37 educational organizations in 17 states

265 middle school students and 176 high school students directly participated in WEAR

Evaluating potential for new technical partner expanding opportunities for students

Exploring new challenge ideas to best serve the Artemis Generation

Planning a new location for the culminating onsite event