National Aeronauticsand
Space Administration

NAC STEM Engagement Committee Meeting

OPEN TO THE PUBLIC

July 20, 2023

NAC STEM Engagement Committee Members

Dan Dumbacher (Chair)
Executive Director, American Institute of Aeronautics and Astronautics

Darryl Williams, PhD
Senior Vice President of Science and Education, The Franklin Institute

Julia Ross, PhD
Dean, Virginia Tech's College of Engineering

Erika Shugart, PhD
Executive Director, National Science Teacher Association

New Members

Juan Amador
Executive Director, SACNAS

Jo Webber, Ph.D.
Founder and CEO of Pod and President of STEMconnector

Ron Ottinger
Executive Director, STEM Next Opportunity Fund

Office of STEM Engagement Overview

VISION

We immerse students in NASA's work, enhance STEM literacy, and inspire the next generation to explore.

MISSION

We engage students in NASA's mission

Strategic Goals

Create **unique opportunities** for a diverse set of students to contribute to NASA's work in exploration and discovery.

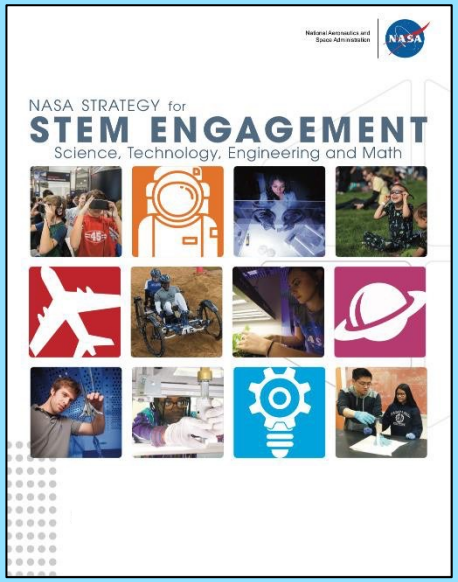
Build a **diverse future STEM workforce** by engaging students in authentic learning **experiences** with NASA's people, content and facilities.

Attract diverse groups of students to STEM through learning opportunities that **spark interest** and **provide connections** to NASA's mission and work.

NASA STEM Engagement Strategic Direction

NASA Strategic Objective 4.3

Build the next generation of explorers. Engage students to build a diverse future STEM workforce.



NASA STEM Engagement Goals:

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

Focus Areas:

- **Expand NASA contributions in engaging K-12 students** in STEM pathways.
- **Broaden student participation** to increase diversity, equity, and inclusion in STEM through NASA opportunities and activities.
- **Build strategic partnerships and networks**, expanding NASA's STEM ecosystem to magnify reach and impact.

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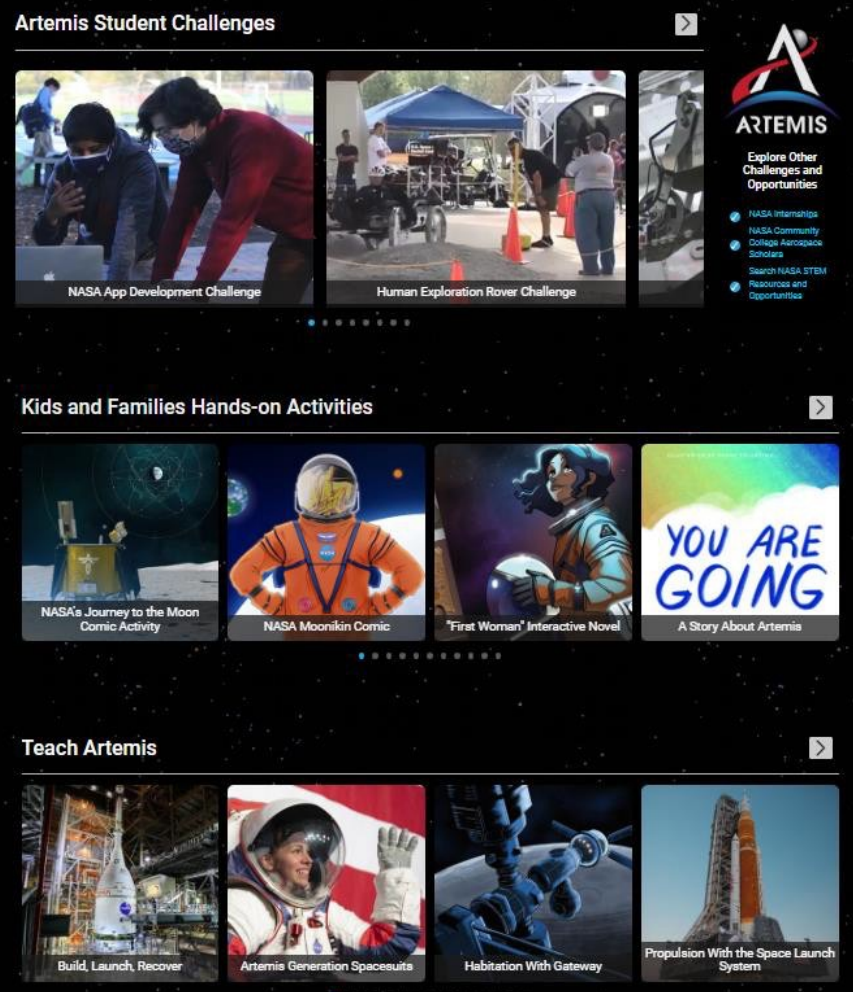
Engaging Students in Artemis

Join Artemis Website



NASA STEM Artemis Camp Guides

First Woman Graphic Novel

Dream to Reality
follows Callie's trailblazing path as the first woman on the Moon.

Educator Guides - Lesson Plans/Activities

Audience: Formal & Informal Educators
Grade Levels: 5-8
Subjects: Engineering design, Mathematics, Physical Science, and Technology

NASA and Microsoft: Minecraft Partnership

Minecraft (owned by Microsoft) is one of the world's most popular video games

- **100M** users in commercial product
- **45M** in education product

Space Act Agreement partnership uses the Artemis Mission to introduce students to STEM concepts and careers

- New Minecraft worlds introduce students to:
  - NASA missions and science
  - a variety of NASA STEM careers
  - coding skills
  - engineering and design thinking skills
- Products will be translated into 29 languages

Total Solar Eclipse Engagement

At its peak, **1,458,212 people** watched NASA's eclipse broadcast live. Total viewership was **13,511,924**.

Over **400 NASA employees** were spread out across **14 locations** across the U.S. to engage the public.

NASA collaborated on social media content with major brands, including Peanuts, Crayola, Sesame Street/Sésamo, LEGO, Barbie, MLB Players Association, and others, reaching over **67M people** and earning over **2.7M engagements**.

Eclipse Learning Cards on Microsoft Edge

Millions viewed eclipse content on the Microsoft homepage

Canva Ed Tech

500k interactions with lessons

Department of Education MOU

Signed May 24, 2023

“Today’s signing, with the support of Vice President Harris and the National Space Council, continues NASA’s collaborative efforts with the Department of Education to amplify the excitement of space to all students across our country, allowing every young person to know they are a part of the Artemis Generation – today and for decades to come.” – *NASA Administrator Bill Nelson*

"I am excited for this partnership with NASA that will inspire and prepare young people from all backgrounds to become our next generation of leaders in STEM fields and to propel our nation and our workforce into the future." – *U.S. Secretary of Education Miguel Cardona*

NASA Administrator Bill Nelson and Secretary of Education Miguel Cardona participate in a memorandum of understanding (MOU) signing ceremony, Wednesday, May 24, 2023, at the Mary W. Jackson NASA Headquarters building in Washington.

Mission Directorate Collaborations

In FY 2024 Mike Kincaid presented to the NASA Advisory Council Aeronautics Committee on the continued collaborations between OSTEM and ARMD.

NASA Grants to Engage Students in Quiet Supersonic Community Overflight

X-59 quiet supersonic research aircraft is dramatically lit for a "glamour shot," captured before its Jan. 12, 2024, rollout
d Martin's Skunk Works facility in Palmdale where the airplane was constructed.
ed Martin / Michael Jackson

Resources for Students and Educators

NASA invests in our nation's future workforce by providing unique STEM opportunities to students, educators, and institutions. Utilizing NASA experts, the agency connects students to exciting NASA missions through dynamic science, technology, engineering, and mathematics content and experiences.

The Resources for Educators and Students flyer contains a collection of links to connect you to a wide array of those resources.

Scan the QR Code to access the NASA STEM resources flyer:

Broadening Student Participation

Stakeholder Events contributing to the evidence base included:

- Equity Action Plan K-12 Stakeholder Town Hall in September 2022
  - Follow-on to K-12 Stakeholder Needs Assessment
- Broadening Student Participation session at OSTEM Better Together Conference in Aug/Sept 2022
  - Identify Barriers and Solutions to BSP in higher ed, K-12, informal
- Overcoming Barriers to Broadening Student Participation Listening Session in June 2023
  - Enable stakeholders to learn from one another about best practices and successful strategies

STEM Engagement Council Working Group on Broadening Participation in Higher Ed Challenges and Competitions

- Developed checklists focusing on general strategies, and strategies for women, tribal colleges, and Historically Black Colleges and Universities
- Internal Broadening Student Participation website under development

Measuring Progress

Learning Question 1

How can NASA STEM Engagement develop cross-project metrics that support internal and external contributions to STEM Engagement goals and objectives?

Learning Question 2

How do NASA Internships broadened participation of underrepresented and underserved students to advance equity and build a diverse future STEM workforce?

Learning Question 3

How can NASA attract K-12 students, especially those underrepresented and underserved, to STEM?

Completed Evidence-Building Activities

- NASA Internship Outcome Assessment Phase I and II
- Workforce and Career Readiness Evaluation Study
- K-12 Stakeholder Needs Assessment and Gap Analysis
- MUREP Program-Level Outcome Assessment Pilot

In-Progress Evidence-Building Activities

- Internship Process Evaluation
- Internships Retrospective Evaluation
- MUREP Program-Level Outcome Assessment
- Space Grant Program-Level Evaluation
- K-12 Student Outcome Assessment
- Evidence-Based Program Design Framework

NASA STEM Engagement Impacts Webpage

STEM Engagement Impacts

Scan the QR code to visit our impacts webpage

STEM Reports
See what NASA STEM Engagement has accomplished

Reach Map and Metrics
See where NASA STEM Engagement has reached learners

Faces of STEM Engagement
Look Who's Interning

STEM Engagement Resources
Search for STEM resources and opportunities

MUREP Outcome Evaluation

FY2020

Phase I Program-Level Evaluation Study

- Focus was on **Efficiency and Effectiveness** of MUREP Management & Operations, **Achieving** NASA STEM Engagement & MUREP **Priorities, Goals, & Objectives**, Identify **Promising Practices** & **Challenges, Sustainability & Partnerships**
- Help prioritize MUREP investments, share promising practices, influence activity design, and improve sustainability and lower barriers to entry
- Included 10 Activities.

Literature Review & Benchmarking Study: **Solicitations**

FY2021

Phase II Program-Level Evaluation Study

- Focus was on **Student Engagement, Partnerships, & Competitiveness**
- Help prioritize MUREP investments, share promising practices, influence activity design, and improve sustainability and lower barriers to entry
- Included 11 Activities
- **Create a Theory of Action and Logic Model**.

FY2022

MUREP Outcome Assessment Framework

- **Development of outcome assessment strategy**
- Provide tools and evidence that that can be used to better understand what achievements are being realized by MUREP investments, and
- Prioritize MUREP investments

FY2023

MUREP Outcome Assessment Study

- **Execute Strategy**
- Assess MUREP outcomes: **Student Engagement & Strategic Partnerships**

FY23 Snapshot

New MUREP Solicitations

MUREP Data Science, Equity, Access and Priority in Research (DEAP) - February 2023

~$500k per award / 3-Year POP

8 Awards

8 HBCUs

MUREP Precollege Summer Institute (MUREP PSI) - March 2023

~$65k per award / 3-Year POP

8 Awards

8 HBCUs / PBIs

MUREP Women's Colleges and Universities (WCU) - June 2023

~$250k per award / 3- 5-Year POP

7 Awards

1HSI / 6 WCUs

FY23 Snapshot

Forthcoming MUREP Solicitations

MUREP Curriculum Awards (MCA) - Tentative July 2023

~$400k per award / 3-Year POP

~4-6 Awards

MUREP Space Technology Artemis Research (MSTAR) – Tentative July 2023

$300k per award / 3-Year POP

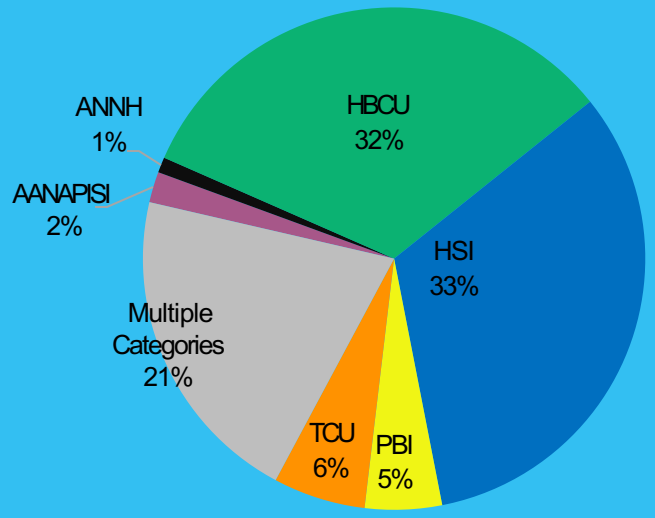
~10 awards

MUREP Partnerships Learning Annual Notification (MPLAN) – Tentative July 2023

$50K per award / 6-Month POP

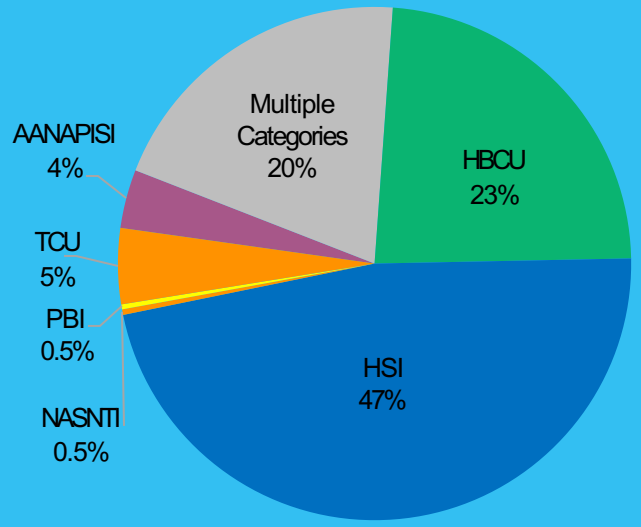
~18 Awards

MUREP Obligations to MSIs (FY21 – FY23)



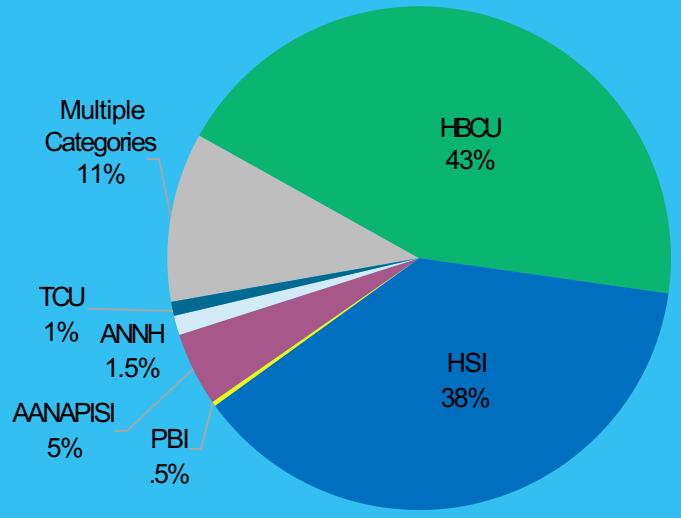
FY21

Total: $24M



FY22

Total: $21M

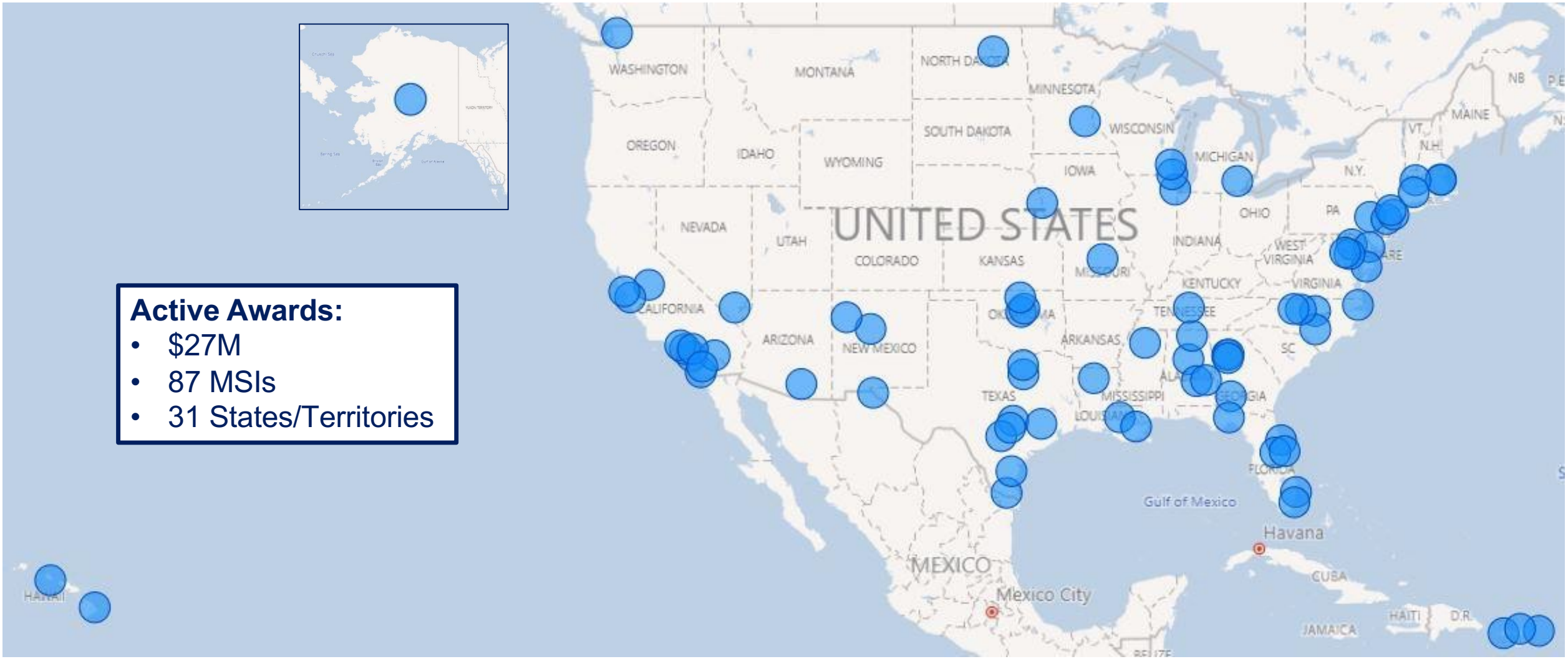


FY23

Total: $20M *

*Preliminary data includes continuing awards; does not include pending awards.

FY2023 Snapshot: MUREP Active Awards



Active Awards:

- $27M
- 87 MSIs
- 31 States/Territories

MUREP MSI Exchange

The MSI Exchange is a public website and searchable database, to present capabilities found at HBCUs / MSIs that are relevant to NASA's Mission. NASA, other federal agencies, industry and academia can search STEM profiles and capability statements to identify Institutions for partnership opportunities.

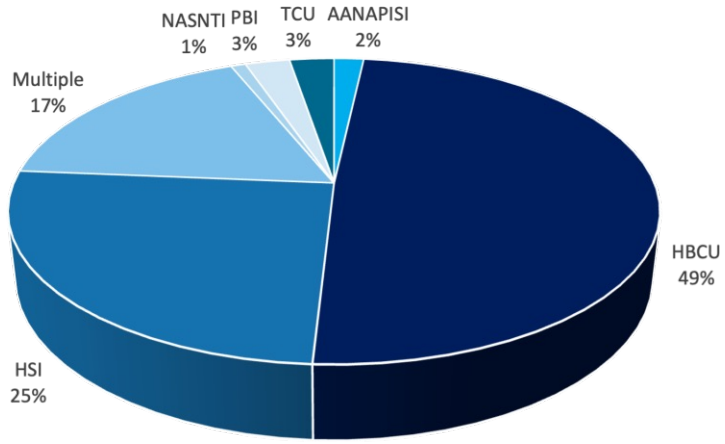
19 Technical Assistance Workshops

126 Searchable Capability Statements

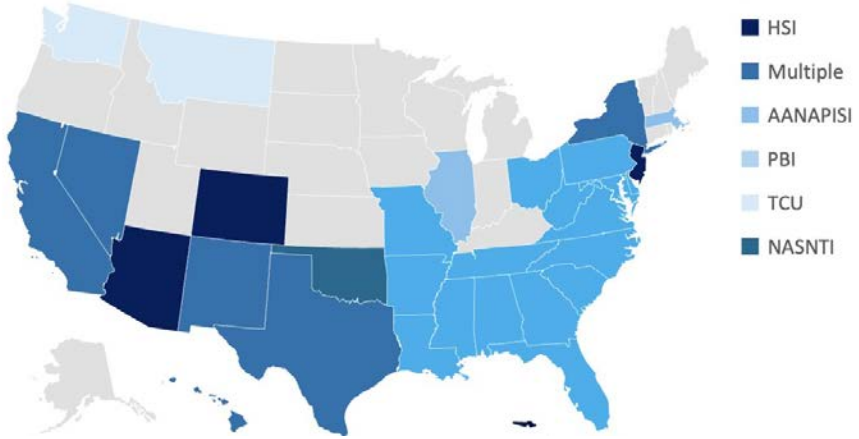
33 States & Territories

Capability Statements in the MSI Exchange

By MSI Type



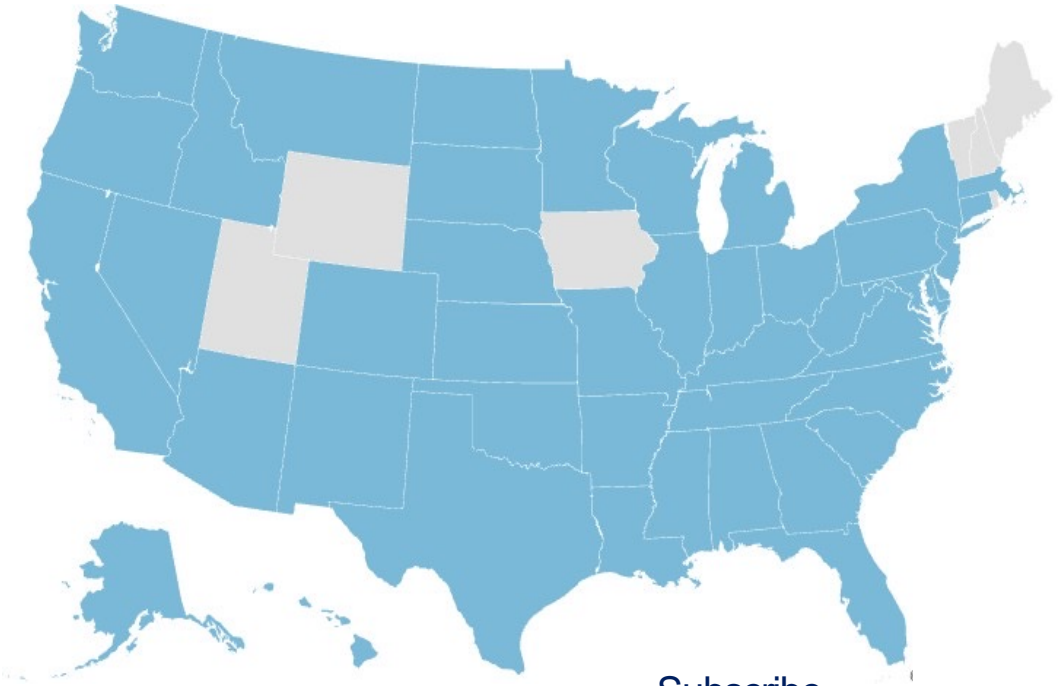
By Location



MSI Engagement Newsletter

By the end of fiscal year 2022, approximately 1,900 representatives from 490 MSIs subscribed to receive MUREP's bi-weekly MSI Engagement Newsletter for NASA opportunities.

Newsletter Reach



Subscribe

MUREP Leveraging Partnerships to Drive Participation

Goal - Create and leverage internal and external strategic partnerships that build capacity at MSIs

Key Partners

Internal:

NASA Mission Directorates:

- Aeronautics Research
- Exploration Systems Development
- Science
- Space Operations
- Space Technology

Mission Support Offices:

OP

SBIR·STTR America's Seed Fund™ POWERED BY NASA

ODEO

OSBP OFFICE OF SMALL BUSINESS PROGRAMS

White House Initiatives:

White House Initiative on Advancing Educational Equity, Excellence, and Economic Opportunity for Hispanics

White House Initiative on Advancing Educational Equity, Excellence, and Economic Opportunity through Historically Black Colleges and Universities

Federal Agencies:

Department of the Treasury; Department of Education; Department of the Army; Department of Defense; NSF; Department of Energy; Department of Transportation; Department of Homeland Security; Department of Housing and Urban Development; National Institutes of Health

Minority Conference Organizations:

National Sponsored Programs Administrators Alliance – NSPAA – of HBCUs, Inc.

AMIE – Advancing Minorities' Interest in Engineering – Achieving Diversity Through Partnerships

CIAA

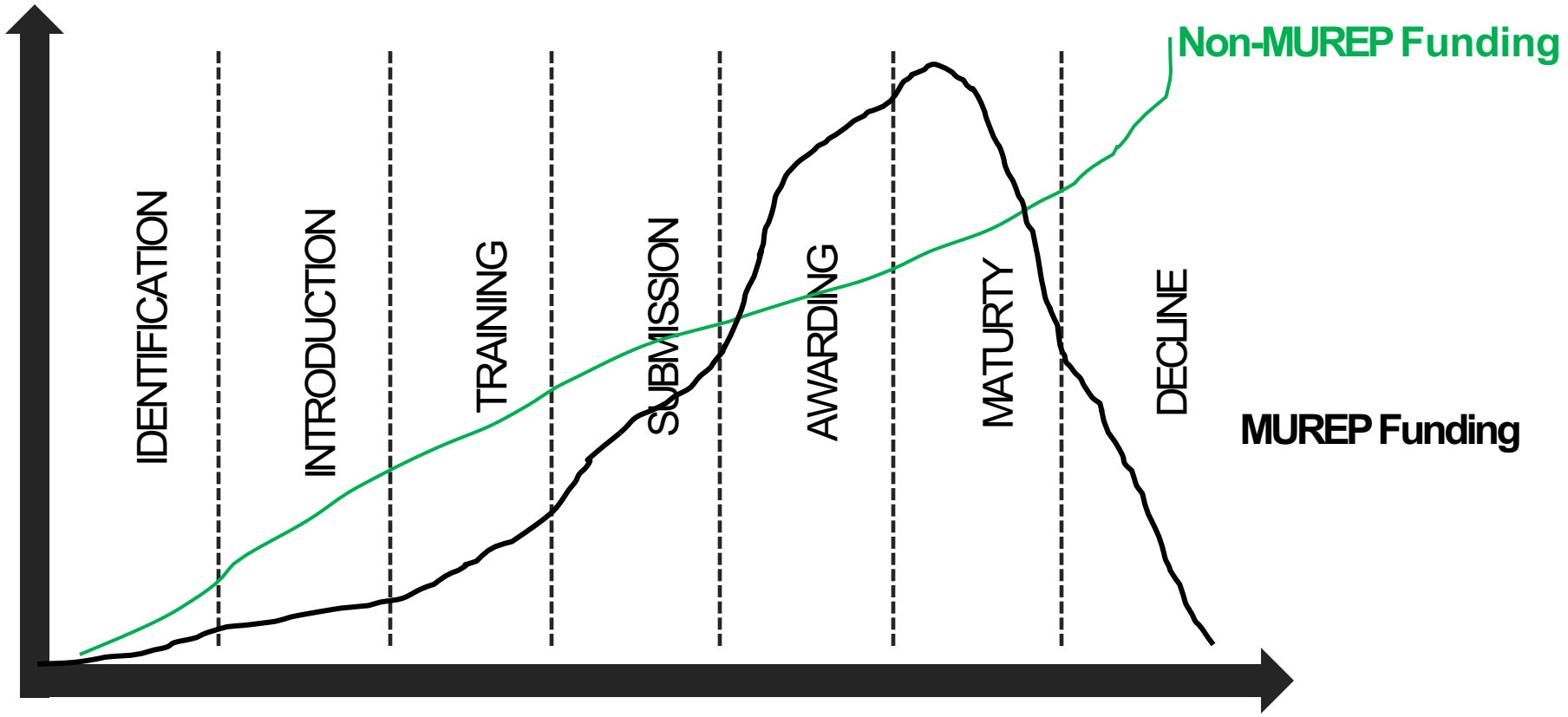
AIHEC

SBE

swe

MUREP Partnerships Continuum

MSI Sustainability Life Cycle



NASA Awards $11.7M to 8 HBCUs – February 2023

MUREP DEAP

Data Science, Equity, Access and Priority in Research and Education

Established to enable HBCU students and faculty to conduct innovative data science research that contributes to NASA's missions.

James E. Shepard, Founder

NASA Awards $3.4M to 7 HBCUs & 1 PBI – March 2023

MUREP PSI

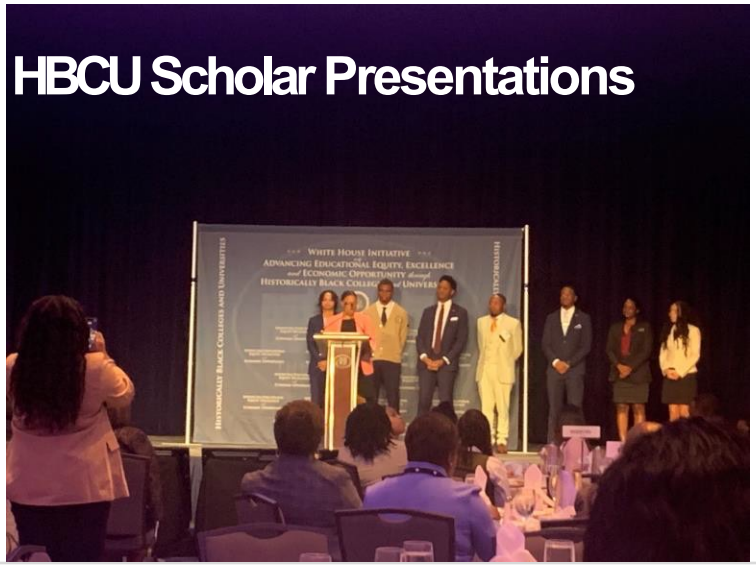
Precollege Summer Institute

Established to enhance high school students' precollege performance and help them achieve success in higher education pursuits and STEM careers

HBCU Week / White House Initiative On Historically Black Colleges and Universities

HBCU Week Conference – Washington DC
September 20 – 23, 2022

- NASA Booth
- Event Live Streaming
- MITTIC (HBCU Scholars)
- Career Recruiting
- NASA Panels



Strategic Partnerships

Through partnerships between industry and NASA's experts and resources, these agreements forge connections to the agency's missions, STEM careers, and more.

NASA supported **23 active national partnerships** in the area of student STEM engagement via Space Act Agreements or Memoranda of Understanding.

This work resulted in **over 7.1 million digital engagements**, including video views and product interactions.

NASA participated in **121 discussions** with external organization related to this work.

Samples of Significant FY 2023 Highlights

- 1.3M interactions with NASA products and opportunities through Discovery Education platform in 2023 school year (August 2023).
- New MOU with US Department of Education to expand STEM Collaboration (May 2023).
- Millions of downloads of Minecraft Artemis games and educational content to engage students in STEM, and computer science and coding careers (March 2023).
- 3.5M K-12 students engaged in Crayola Creativity Week (January 2023).
- 95K student interactions with NASA-themed Hour of Code resources in partnership with Code.org (December 2022).
- 2M views of NOGGIN Space Explores content developed for pre-K audiences in partnership with NASA (October 2022).
- 32K views of Introduce A Girl to Engineering Day live Q&A with Artemis leadership (February 2023)

Partnership Selection Criteria

Office of STEM Engagement releases on open call for partnerships. This document is updated annually based upon feedback from the SEC and OGC.

- Goals
- Priorities
- Supports Available
- Selection Process and Criteria
- Format for Statement of Interest Submission
- Timeline
- Shell Agreement

Selection Criteria (Top Level)
Alignment to Goals
Benefit to NASA and Partner
Target Audience
Diversity and Inclusion Plan
Intended Outcomes
Anticipated Return on Non-Financial Investment
Timeline

https://www.nasa.gov/stem/partnerships/index.html

US Dept of Education MOU

MOU Highlights

- White House Space Priorities
- You Belong in STEM Campaign
- Earth System Research
- Inspiration Through Missions

Priority Points

- Strengthen coordination around strategies, plans and communications
- Expand Access to Research, Internships, etc
- Support STEM Ecosystem Effort
- Increase Teaching Capacity
- Diversity and Inclusion Efforts
- Career and Technical Education
- Broad Based Student Engagement

Science Webinar Series

Collaborative Webinar Series for Partners

- Developed with SMD and OCOMM
- Upcoming Topics
  - Eclipse (July)
  - Asteroid Autumn (August)
  - James Webb (December)
  - Eclipse Update (February)

Eclipse Agenda

- Eclipse Overview and Safety
- Connections to NASA Mission and Key Messages
- NASA Engagement Plans


Findings and
Recommendations

Findings

- OSTEM Engagement continues to do an outstanding job of building the NASA STEM Engagement,
  - Coordinating across the Mission Directorates,
  - Describing new analyses and metrics that measure the impact towards achieving the Strategic Objectives
  - Incorporating previous recommendations in a responsive and thorough manner

- OSTEM is developing useful methods to measure outcomes, including assessment of participation, initial findings and lessons learned – all key to building external awareness across the STEM communities

- FY23 strategy is thoughtful, with measurable goals and objectives, robust strategies, and intentionality toward the existing strategic direction and infrastructure

- Appropriate funding is necessary to continue OSTEM's important work, including MSI's and partnerships, at least at the FY24 President's Budget Request Level

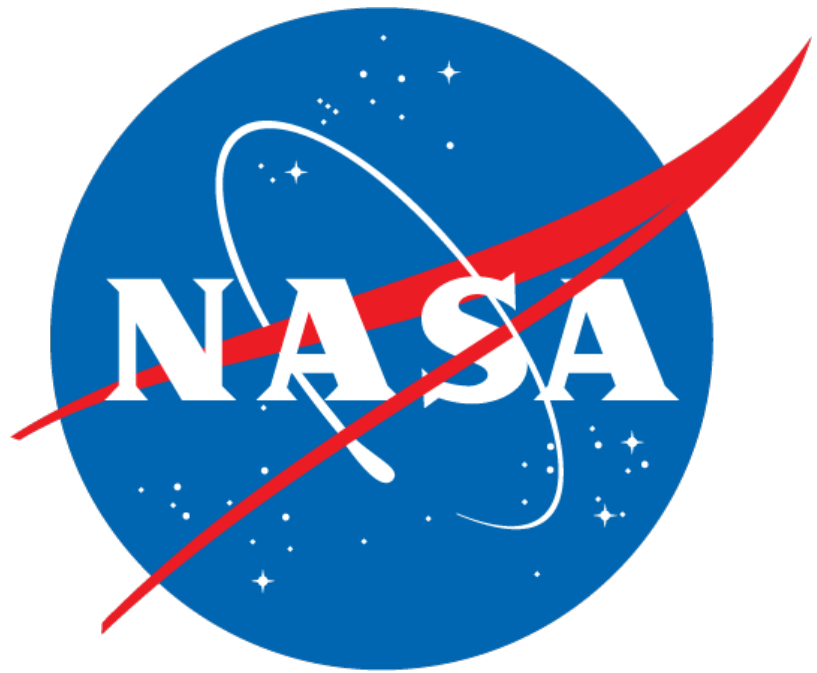
Recommendations

1. Committee recommends NASA catalyze additional efforts by the mission directorates to more directly support MUREP, such as co-funding the institutions in addition to the OSTEM funding. The MSI's are research sites making meaningful contributions to NASA's science and engineering knowledge and practice

2. Committee recommends NASA serve as a "broker" to develop a more in-depth understanding of MSI's grants by supporting a structured networked community. MSI's should be encouraged to leverage core competencies to grow the expertise across the MSI funding landscape. MSI's should assess, with NASA facilitation, institutional core competencies, opportunities to improve cross institutional team efforts and thereby increase impact of NASA funding opportunities

3. NASA should continue to furnish representation of diverse role models to ensure visibility, connection, and reflection of a diverse workforce that is absolutely essential for the future given the increasing global competition

4. Committee recommends NASA develop creative ways to engage under-represented communities attending educational institutions, in addition to the MSI community, at the undergraduate, graduate, high school levels


NASA

FY23 STEM Engagement Performance

Significant Awards

In Fiscal Year 2023, NASA provided **9,436** internships, fellowships, research opportunities, educator professional development, challenges, and other college/pre-college STEM engagement opportunities to **8,835** student and educator participants representing K-12 institutions and higher education institutions including 2-year, 4-year institutions and all Minority Serving Institution (MSI) classifications. These significant awards provided **~$44.2M** in direct financial support to participants and engaged participants in over **2.3M** total contact hours.

In these opportunities, **15.8%** of participants identified as racially underrepresented* and **17.5%** of participants identified as ethnically underrepresented**. Also, **43.1%** of the Agency's higher education internships and fellowship positions were filled by women. NOTE, all three underrepresented statistics (i.e., race and ethnicity) exceeded the national averages for underrepresented students enrolled in STEM degree programs (per the National Center for Educational Statistics - https://nces.ed.gov).

Research and Development

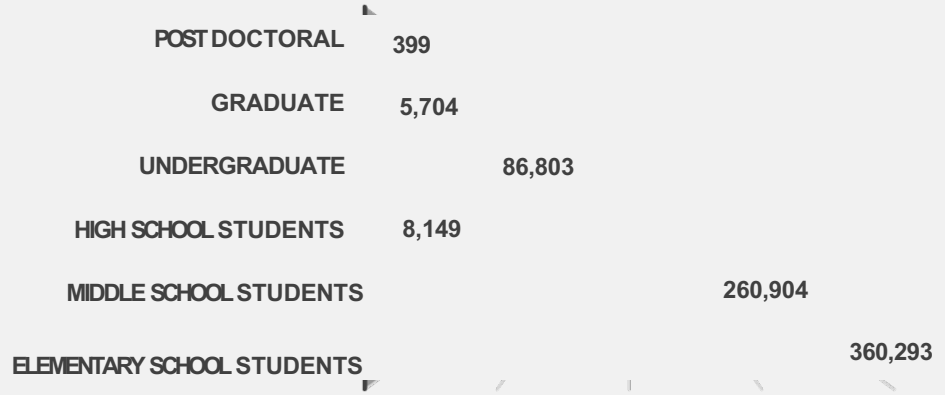
NASA's performance in providing opportunities for learners to contribute to NASA's aeronautics, space, and science missions and work is assessed across peer-reviewed publications, technical papers and presentation directly resulting from research funded by NASA STEM Engagement grants and awards to higher education institutions.

Space Grant, Minority University Research & Education Project (MUREP), and Established Program to Stimulate Competitive Research (EPSCoR) grantee and awardee institutions reported **3,544** peer-reviewed publications, technical papers and presentations in FY 2023.

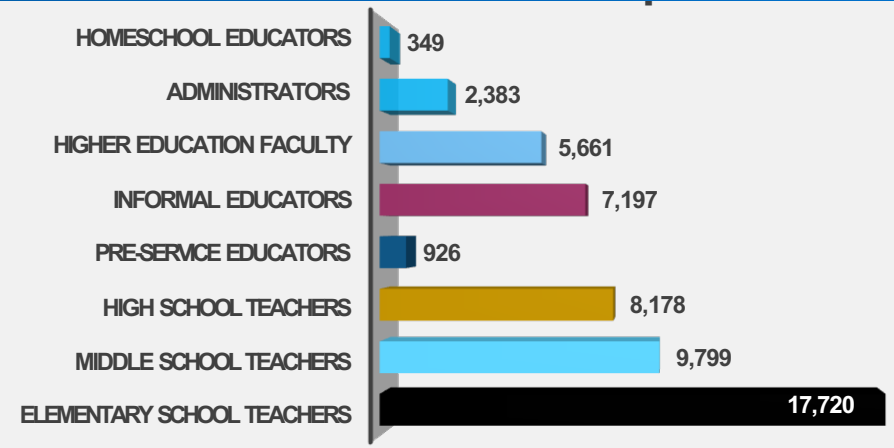
Notably, **61%** percent of the peer-reviewed and other technical publications were authored or coauthored by students.

Additionally, **51** patents and technology transfers were awarded to higher education institutions as a direct result of their NASA STEM Engagement grants or cooperative agreements.

750K+ Student Participants



52K+ Educator Participants



NASA STEM INSPIRE - ENGAGE - EDUCATE - EMPLOY
The Next Generation of Explorers

*Underrepresented racial categories (American Indian or Alaskan Native; Black or African American; and/or Native Hawaiian or Pacific Islander)

** Underrepresented ethnicity (Hispanic or Latino)

stem.nasa.gov

STEM Engagement Budget Summary

	President's Budget Request (FY2025)				
($ in millions)	TOTAL	SPACE GRANT	EPSCoR	MUREP	NextGen STEM
STEM Engagement	$143.5	$57.0	$24.8	$46.3	$15.4

Within a constrained budget, this request prioritizes funding for MUREP and Next Gen STEM to expand the reach and impact of NASA's STEM efforts, including expanding NASA programming targeting partnerships with external organizations:

Minority University Research Education Program (MUREP) - $46.3M

- Implements multiple competitive award opportunities for MSIs that align with Mission Directorate priorities.
- Focused engagement with community colleges and other two-year institutions to foster deeper connections with these institutions and the students that they serve.

Next Gen STEM - $15.4M

- Expands the footprint of K-12 students and educators through a continuum of learning opportunities and experiences leveraging NASA's people, missions and work, and content.
- Implements a pilot effort for partnerships jointly funded by NASA and external organizations, advancing K-12 objectives.

NASA Space Grant - $57.0M

- Reduces support compared to the FY 2024 Budget request (but still above the 2023 level) for a new collaboration with ARMD in support of the University Student Research Challenge. In addition, Space Grant consortia award augmentations, currently $110K, will be reduced.

Established Program to Stimulate Competitive Research (EPSCoR) - $24.8M

- Executes its multiple competitive awards portfolio and successful partnership with the National Science Foundation (NSF)

FY2022-23: STRATEGIC PARTNERSHIPS

Engagement with **121** Organizations

Key Numbers

23 Active Enterprise OSTEM Non-Reimbursable Space Act Agreements

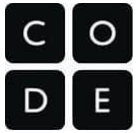
17 Artemis I Themed Opportunities development in collaboration with partners

7M+ Digital engagements (Content Downloads, Education Multi-Media Uses and Virtual Event Participants)*

*FY 22 Metrics Provided by Partners or available through Public Sources

Example Collaborators

Microsoft



girl scouts