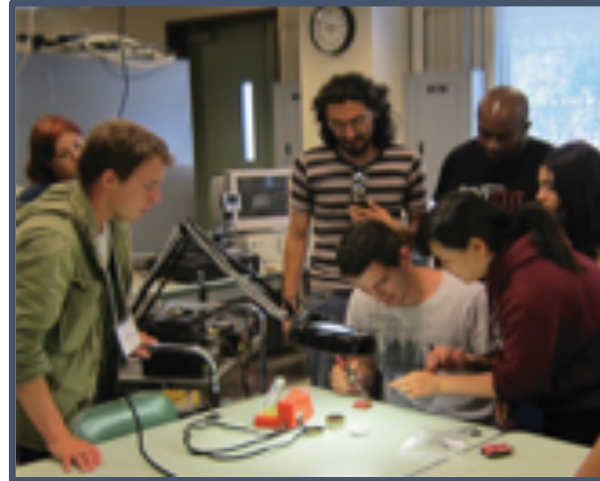




INSPIRE - ENGAGE - EDUCATE - EMPLOY

The Next Generation of Explorers



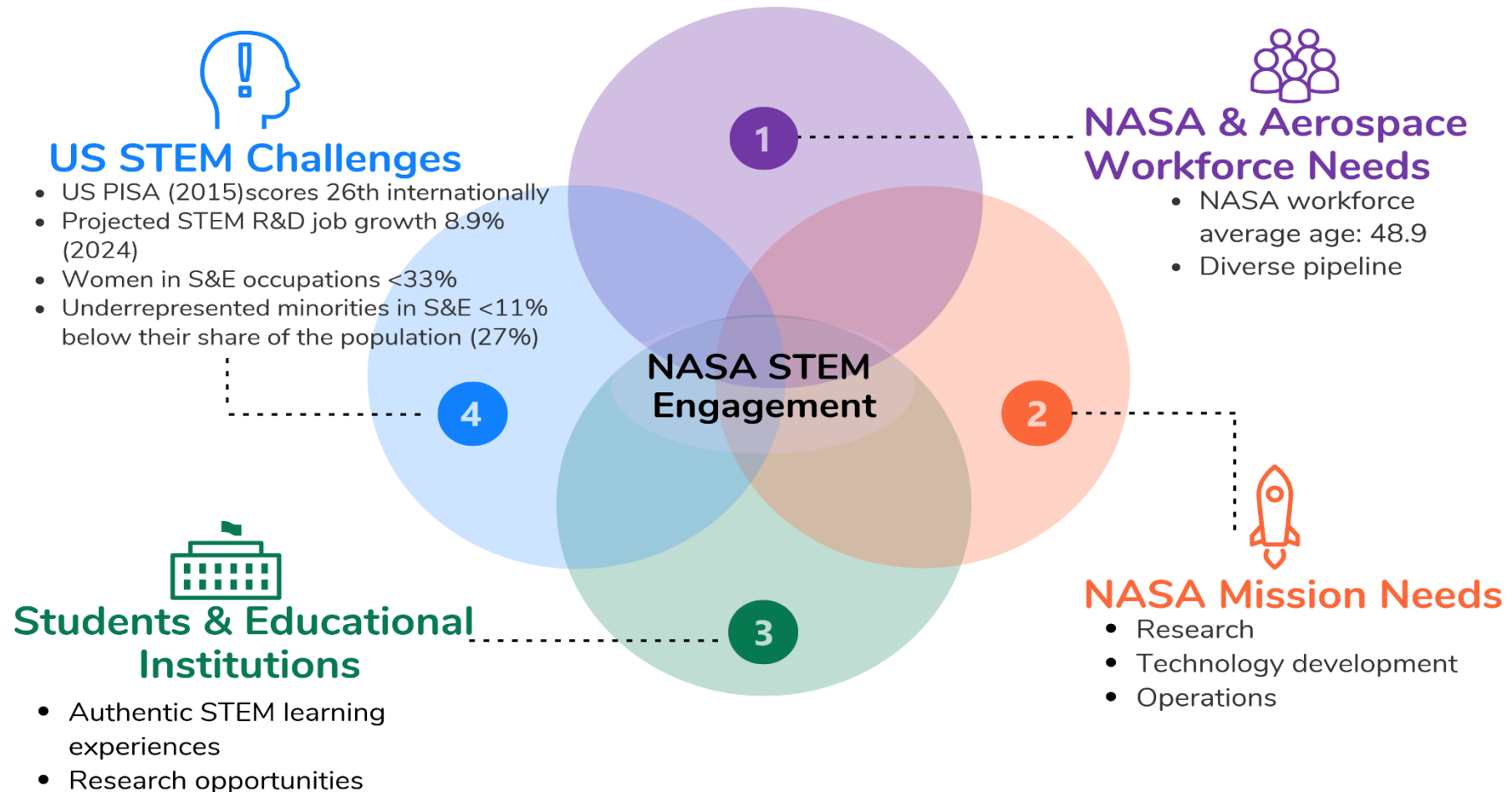
NASA ADVISORY COUNCIL – HEO COMMITTEE

OFFICE OF STEM ENGAGEMENT UPDATE

OCTOBER 30, 2019

MIKE KINCAID
ASSOCIATE ADMINISTRATOR FOR STEM ENGAGEMENT

NASA'S CONTRIBUTIONS TO AMERICA'S STEM ECOSYSTEM



 NSF Science and Engineering Indicators Report (2015)

ARCHITECTURE ENABLING STUDENT OPPORTUNITIES & CONTRIBUTIONS

NASA MISSION DIRECTORATE DRIVERS & REQUIREMENTS



FOCUS AREAS

Evidence-based strategies

Rigorous planning



Integrated operational model

Create unique opportunities for students to contribute to NASA's work.

Build a diverse future STEM workforce by engaging students in authentic learning experiences.

Strengthen understanding of STEM by enabling powerful connections to NASA's mission and work.

Strategic, balanced portfolio

NASA-unique learning experiences



Student contributions to NASA's work in action

SCALABILITY TO MAGNIFY NASA'S REACH AND IMPACT

K-Elementary School



Middle School



High School



Undergraduate



Graduate



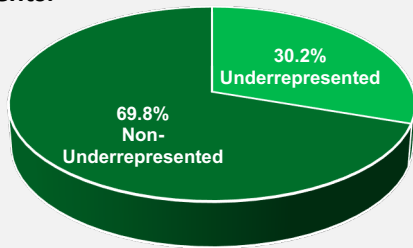
BENEFICIARIES OF NASA'S
STEM ENGAGEMENT PORTFOLIO

FY 2018 NASA STEM ENGAGEMENT PERFORMANCE ASSESSMENT

Internships and Fellowships

8,005

In Fiscal Year 2018, NASA provided 8,005 internships and fellowships to 7,357 higher education students across all institutional categories and levels. These significant awards provided a total of over **\$32M** in direct financial support to higher education students.



30.2% of higher education internships and fellowships were awarded to racially or ethnically underrepresented student participants, compared to 24.5% for the national average of STEM degree enrollees.

Additionally, **39.5%** of the Agency's higher education internships and fellowship positions were filled by women.

Research and Development



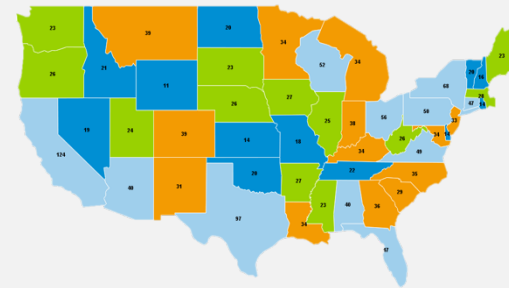
NASA's performance in providing opportunities for learners to contribute to NASA's aeronautics, space, and science missions and work is assessed across peer-reviewed publications and technical paper presentations directly resulting from research funded by NASA STEM Engagement grants and awards to higher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

1,378

Space Grant, MUREP, and EPSCoR grantee and awardee institutions reporting 1,378 peer-reviewed publications and technical papers and presentations in FY 2018.

Collaborators

1,695



NASA's Office of STEM Engagement collaborators are funded and unfunded and located in all 50 states, DC, GU, PR, and VI. Collaborators include: government agencies, industry, formal and informal education institutions including museums, science centers, planetariums, and youth-serving organizations, non-profit, and other education organizations. Collaborators extend the reach of NASA STEM engagement opportunities by supporting the execution of an opportunity. In FY 2018 OSTEM collaborated with 1,695 institutions and organizations.

Leveraging Partnerships and Network to Broaden the Reach of NASA STEM Engagement Investments

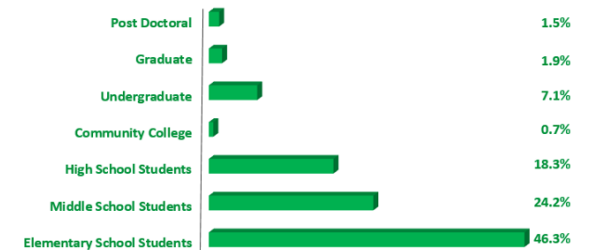
50+

states & territories

Competitive Grants and Cooperative Agreements Awarded to **95** Education Institutions located in all **50** States, the District of Columbia, Guam, Puerto Rico, and the Virgin Islands.

Engaging Students in NASA Missions

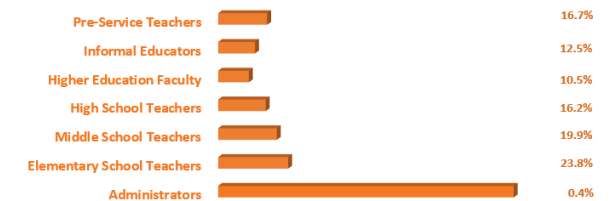
827,257* Students participated in NASA STEM engagement activities



*Participation numbers are self-reported by external grantees, awardees, and collaborators.

Training STEM Educators to Engage the Next Generation of STEM Researchers and Explorers

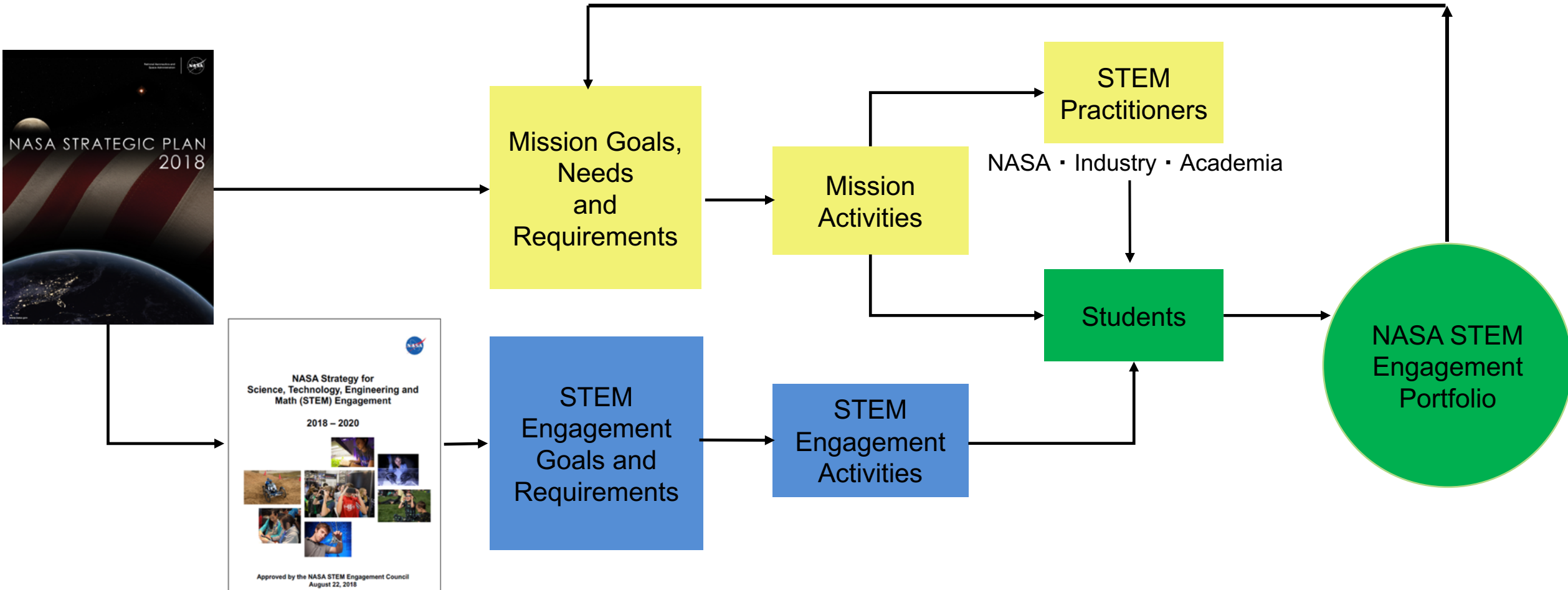
182,601* Educators participated in NASA STEM engagement training activities



*Participation numbers are self-reported by external grantees, awardees, and collaborators.

NASA STEM ENGAGEMENT PORTFOLIO - DRIVERS & CONTRIBUTIONS

Student contributions to NASA's work in action



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

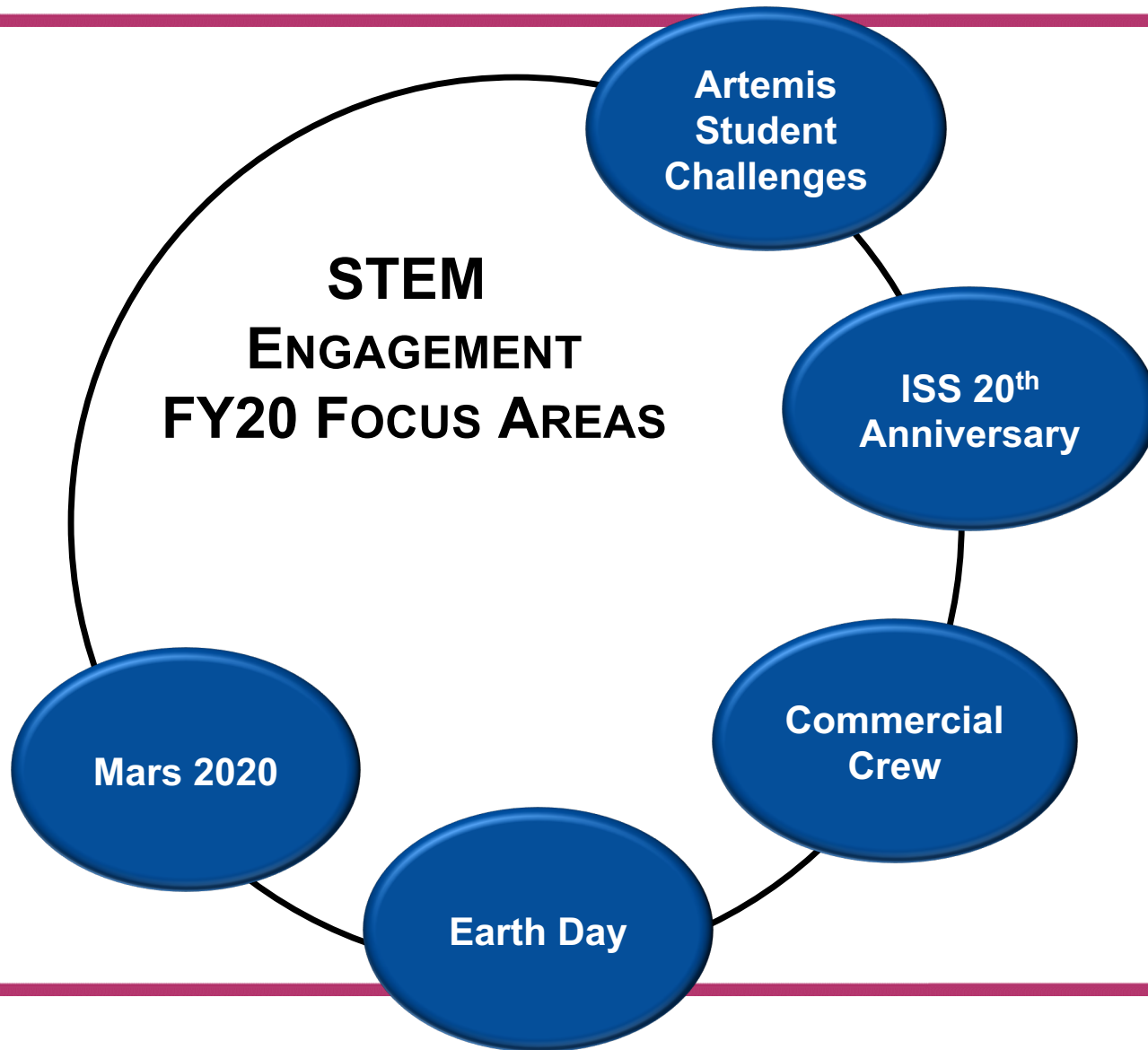
NASA STEM ENGAGEMENT PORTFOLIO SNAPSHOT

CONTRIBUTIONS BY ORGANIZATION

Types of Activities	ARMD	HEOMD	SMD	STMD	OSTEM	*Other	Totals
Internships		2	5		4		11
Challenges, Competitions & Contests	2	11	4	4	2	1	24
Fellowships	1			1	2		4
R&D Opportunities			2		9		11
Pre-College STEM Experiences		3	2		7		12
College STEM Experiences				1	4		5
STEM Content & Products	5			1	5		11
Virtual Learning Opportunity							
Institutional Support			2	1	4		7
Faculty & Educator Support			2	1	6		9
Total:	8	16	17	9	43	1	94

*Note: Supported by Center-Based or other Functional Offices

FY2020 STEM ENGAGEMENT SPHERE 1 ACTIVITIES



Approved by the STEM Engagement Council
October 16, 2019

ARTEMIS STUDENT CHALLENGES

Human
Exploration Rover
Challenge

Student
Launch

Micro-G
NExT

2020 BIG Idea
Challenge

Lunabotics
Competition

S.U.I.T.S



www.nasa.gov/artemis

National Aeronautics
and Space Administration



SPACE & STEM

NASA STEM PRESENTS

SPACE & STEM

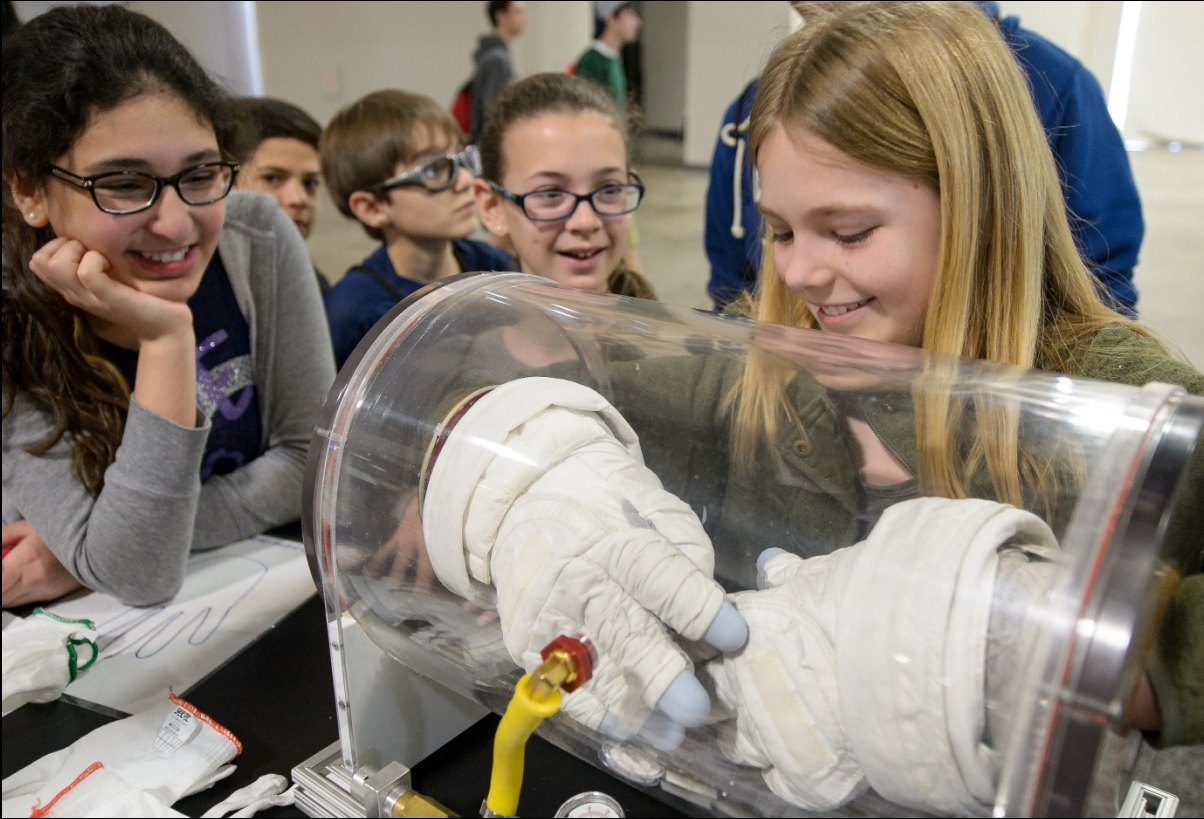
Wednesday, October 23

6:30 p.m. EDT

LIVE ON NASA TV

HOST A WATCH PARTY & GET INVOLVED!
www.nasa.gov/JoinArtemis

Commercial Crew



- Students and educators **embrace the importance** of achieving safe, reliable and cost-effective access to low-Earth orbit.
- Develop and deploy an evidence-based toolkit of resources and content for educators and students that includes **engineering challenges, coding, digital badging, virtual reality** and more.

ISS @20

- Bring **ISS into the classroom!** Leverage STEM on Station content, provide student opportunities to engage in ISS research and deliver the excitement of science and technology to students in the classroom.
- *This is a milestone. It symbolizes exploration by all that dare to dream and work hard to achieve that dream – we hope an inspiration for all **future explorers**.* Astronaut Christina Koch, October 18, 2019.



Mars 2020



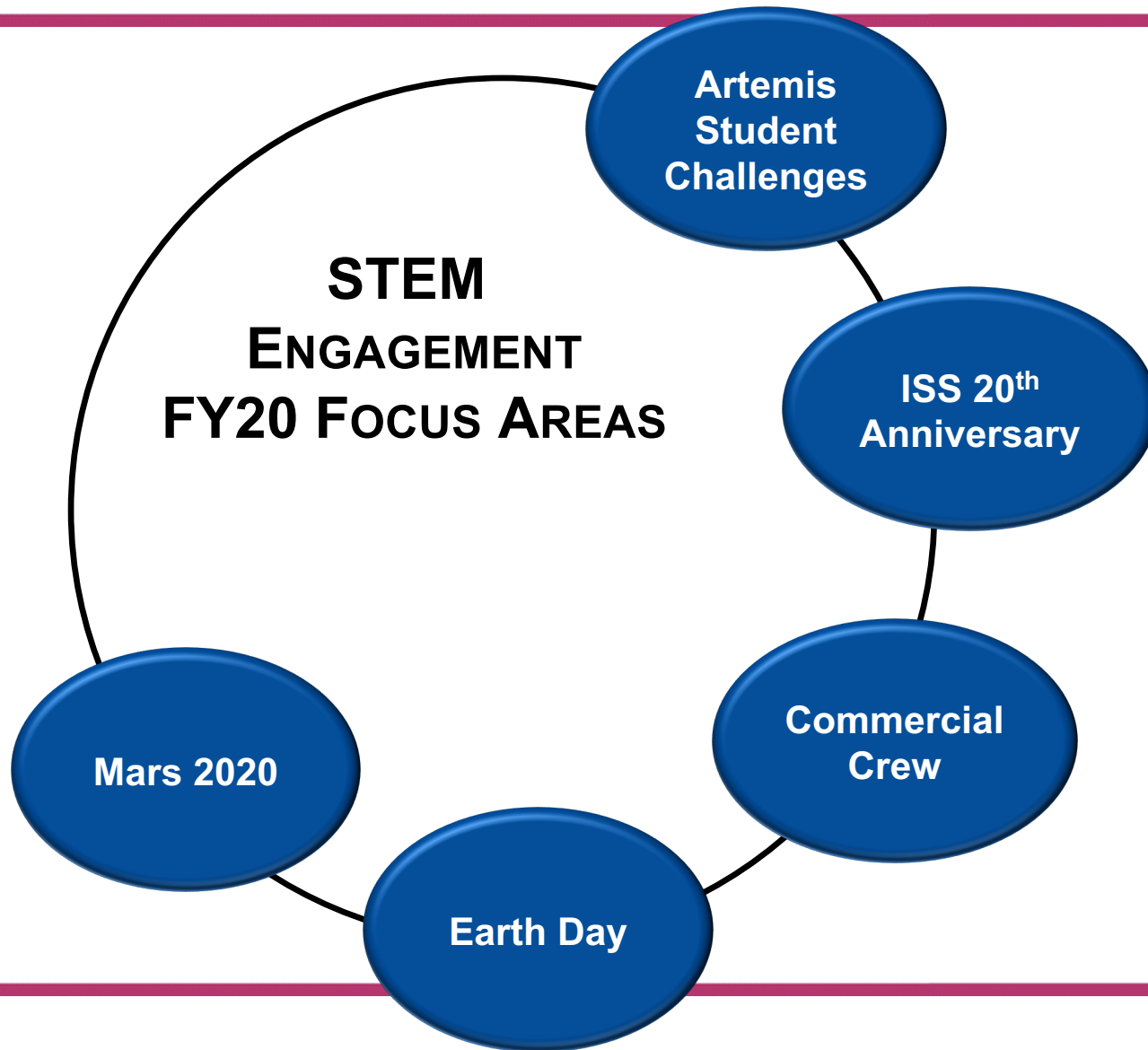
- Create and disseminate **immersive virtual experiences**, classroom lessons and activities for students and educators in advance of the launch and landing of Mars 2020.
- Utilize Mars 2020 as a platform to **engage a broad and diverse** student population across the U.S.

Earth Day

- Engage students and educators through content, lessons and activities that use the vantage point of space to **understand and explore our home planet** and create powerful connections to the 50th Anniversary of Earth Day.



SPHERE 1 IMPACT AND SUCCESS CRITERIA



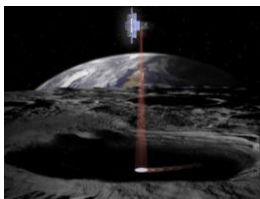
Success criteria:

- Increased diversity of student and institution participation
- Movement along the continuum of the design principles
- Documented improvements and/or resulting outcomes
- Defined metrics for each activity
- STEM Engagement content is consistent and streamlined

Envisioned impacts:

- Increased leverage and coordination of Agency resources
- Increased and broader participation
- Enhanced diversity of students and institutions
- Expanded geographic reach
- Expanded network across Agency and external partners
- Increased scope and scale
- Increased access to cadre of experts

MISSION-DRIVEN STEM ENGAGEMENT PROGRAM



Space Grant

- National network of 52 Consortia with over 1000 Affiliate members
- Stimulates cooperative programs among universities, industry, federal/state/local governments
- Encourages interdisciplinary education and research programs
- Incorporates State priorities, needs, and goals

Established Program to Stimulate Competitive Research (EPSCoR)

- 28 eligible jurisdictions (states and territories)
- Contributes to development of research infrastructure and capabilities
- Fosters partnerships between NASA Mission Directorates, research entities, industry and universities
- Incorporates state priorities, needs, and goals

Minority University Research & Education Project (MUREP)

- Limited to Minority-Serving Institutions
- Increases awareness and retention of underserved and underrepresented groups in STEM
- Enhances infrastructure at MSI institutions
- Diverse Portfolio that engages K-12, higher education and community colleges in STEM

Next Gen STEM

- Informal education and K-12 STEM engagement initiatives aligned to mission priorities
- Richer, more comprehensive STEM engagement opportunities
- NASA's Museum Alliance

K-Elementary School



Middle School



High School



Undergraduate



Graduate



STEM ENGAGEMENT BENEFICIARIES

SPACE GRANT: EVOLVING SUPPORT TO MDs

Broadly engage **all Mission Directorates** to define and implement **investment matching opportunities** spanning our agency-wide portfolio, with a large array of identified benefits:

- Technical needs of NASA's Mission Directorates directly addressed
- Student experiences genuinely contribute to NASA's mission, leading to high-quality, exciting, authentic experiences as a result
- A vast nationwide network of strategic partners, such as the Space Grant Consortia, becomes more energized ... and expands over time

Identify and promote best practices, follow-on efforts are scaled up, and nationwide, **diverse student participation grows** while bringing NASA's missions closer to communities across the nation ... **which will be an interactive and iterative process**

ARTEMIS STUDENT CHALLENGES

Human
Exploration Rover
Challenge

Student
Launch

Micro-G
NExT

2020 BIG Idea
Challenge

Lunabotics
Competition

S.U.I.T.S



www.nasa.gov/artemis

STATUS: EVOLUTIONARY ACTIVITIES

Artemis Student Challenges (HEOMD and STMD)

- 2019 Artemis-focused Request For Information (RFI)
- August 2019 RFI Closed
- September 2019 Review RFI Responses and strategize next steps with HEOMD/STMD
- November 2019 Release Solicitation to the Space Grant Community
- Est. Early-2020 Selection of One-Year Pilot Activities and/or Planning Awards

Space Technology Mission Directorate (STMD)

- 2020 BIG Idea Challenge
- August 2019 Details Publically Released:
Focus is on Lunar Exploration in the Permanently Shaded Regions and In Situ Resource Utilization
- January 2020 Proposals Due
- February 2020 Selections Made



Administrator Bridenstine Visited Georgia Tech on July 31st and shared his vision:

“When we partner with a university ... the students actually develop the technology that we fly to the moon. And then, when they graduate, not only do they have the educational background, but they have the hands-on experience that we can take advantage of and put them right to work.”

The 2020 BIG Idea Challenge

Seeks innovative ideas from the academic community for a wide variety of concepts, systems, and technology demonstrations to address near-term technology capability requirements to support NASA's exploration objectives for Permanently Shadowed Regions in and near the Moon's polar regions



<http://bigidea.nianet.org/>

- Objective: Develop a STEM-trained workforce with skills and experience aligned directly with agency mission needs through rigorous competition designed to address technical gaps required to advance space exploration.
- Eligibility: US Space Grant universities; non-space grant universities may partner with a lead Space Grant university; undergrad and graduate
- 5-8 teams; 5-20 students per team
- \$50K - \$180K development and participation stipend per university team (matching funds between STMD and Space Grant)
- Competitive Elements: Proposal; Mid-Point Project Review/Video; Proof-of-Concept; Technical Paper; Poster; Judged F2F Design Review; Model/Prototype/Demonstration
- Challenge Launched August 2019; Full academic-year cycle PLUS extension through October

FY20 BIG Idea Proposal Themes/Categories

Exploration of PSRs in polar regions

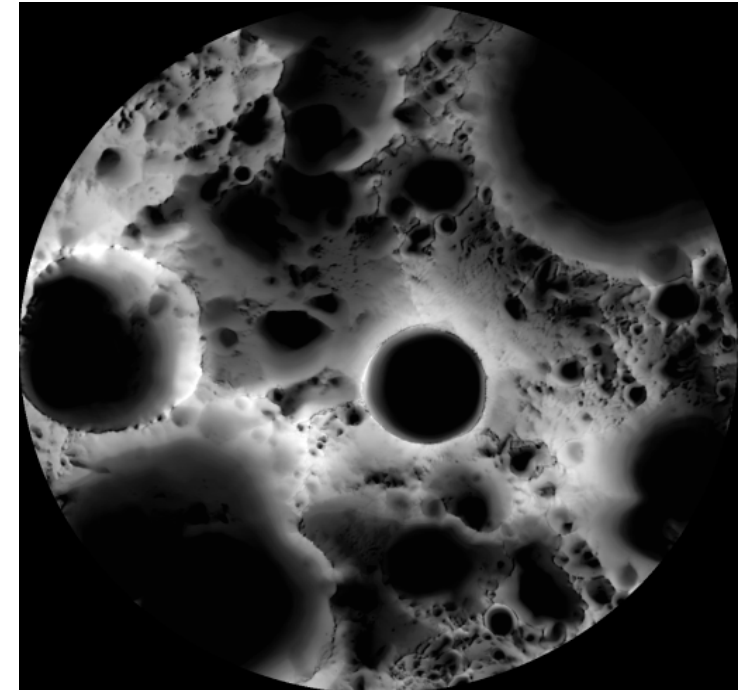
- Characterizing the regolith/ surface consistency within the PSR
- Locating and characterizing lunar water, or other hydrogen-rich deposits
- Identifying water concentrations - understanding how water ice is mixed with the regolith
- Thermal environment of the regolith in a PSR

Technologies to support Lunar ISRU in a PSR

- Collecting icy regolith
- Transporting and storing collected water
- Water purification
- Demonstrating electrolysis in the relevant environment

Capabilities to explore and operate in PSRs

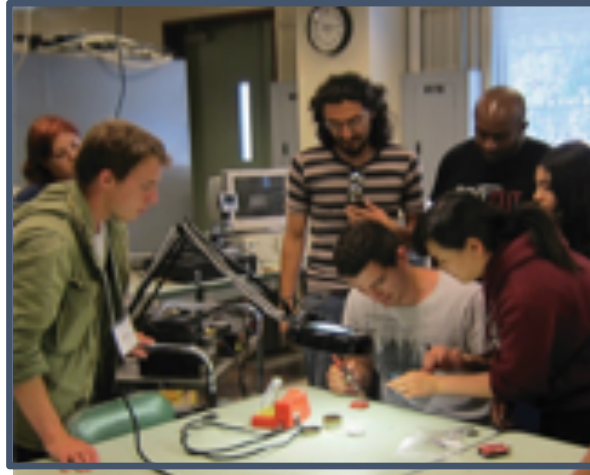
- Innovations in mobility systems
- Innovations in navigation systems
- Innovations in power systems
- Innovations in communications systems
- Innovations in sensing systems





INSPIRE - ENGAGE - EDUCATE - EMPLOY

The Next Generation of Explorers



NOTABLE MILESTONES: NASA STEM ENGAGEMENT ON THE WEB



Implemented a new website for NASA's STEM Engagement Enterprise

- **New Super Search Engine**
 - Allows students, educators and families to more readily find opportunities to engage with NASA
 - Users can filter and sort content based on audience, opportunities, date or location, grade, subject, and resource type
 - Existing content collections have also been expanded to include topics for students
- **Improved look, organization and navigation**
 - Allows content offerings to be sorted and grouped for students and educators by grade appropriateness or by relevant themes or topics

<http://stem.nasa.gov>

STEM ENGAGEMENT PORTFOLIO DESIGN PRINCIPLES AND CRITERIA

Criteria	STEM Engagement Implications
1. Scope	STEM Engagement includes all of NASA's efforts to attract, engage and educate students and support educators and institutions.
2. Design Principles	Activities must be mission-driven authentic STEM experiences. Activities do not have to integrate all four design principles, but they should incorporate as many as possible.
3. Alignment	Demonstrates direct alignment and contributions to the NASA Strategy for STEM Engagement objectives and strategies and the NASA Strategic Plan.
4. Benefits	Has a direct or indirect benefit to students.

Design Principles	Definition
Mission-driven authentic STEM experiences	Experiential opportunities, design and development activities, research experiences, and/or products that contribute to NASA's endeavors in exploration and discovery and help solve problems and address needs and priorities that are critical to NASA's mission.
Evidence-based practices	Guidelines, strategies, frameworks, and promising practices informed by research, literature reviews, and/or evaluation to build the available body of facts (evidence) confirming program effectiveness and impact.
Diversity and inclusion	Infuse objectives and target strategies, where practicable, to attract and sustain diversity in student participation, and to incorporate approaches to foster and promote inclusion.
Scalability through partnerships and networks	Incorporate in the design of an activity or product, where appropriate, attributes and characteristics that provide opportunities to leverage partnerships and networks in order to magnify reach and impact