National Aeronautics and Space Administration

NASA STRATEGY for STEM ENGAGEMENT

Science, Technology, Engineering and Math

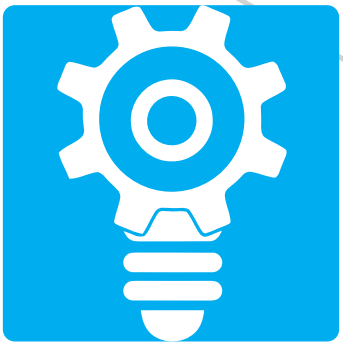













2020-2023

Approved by the NASA STEM Engagement Council

April 29, 2020

PURPOSE AND SCOPE

The NASA Strategy for Science, Technology, Engineering and Mathematics (STEM) Engagement serves as a roadmap to frame and guide the Agency's work to benefit students over the next three years. The scope of STEM engagement encompasses all endeavors Agency-wide to attract, engage and educate students and to support educators, educational institutions, and professional and student organizations. STEM engagement is comprised of a broad and diverse set of programs, projects, activities and products developed and implemented by Headquarters functional offices, Mission Directorates and Centers.

This strategy builds on the direction and solid foundation defined and executed via the NASA Strategy for STEM Engagement (2018-2020), and aligns with the Federal Strategy for STEM Education and Engagement (2018-2023), Charting a Course for Success: America's Strategy for STEM Education.

The NASA Strategy for STEM Engagement provides the context for STEM engagement within the NASA strategic plan, and describes the cross-cutting design principles foundational to this work. It serves as the framework for the Agency to provide immediate benefits to students, educators, and educational institutions, and to help build the next generation of explorers with the technical skills needed to continue pursuing NASA's mission.

NASA's STEM Engagement community works in close collaboration with NASA's STEM workforce to provide exceptional experiences for students, and with NASA's public engagement workforce to leverage opportunities for reaching students. NASA is committed to finding innovative ways to deliver content and engage students in STEM learning.

The NASA Strategy for STEM Engagement 2020-2023 serves as the roadmap for the Agency's work devoted to STEM engagement, with defined objectives and strategies to drive requirements and alignment of all STEM engagement efforts, including programs, projects, activities and products.

NASA VISION AND MISSION FOR STEM ENGAGEMENT

The vision, mission and strategic goals for STEM Engagement drive a systematic approach to move students across a spectrum of learning to inspire, engage, educate and eventually employ.

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

STRATEGIC GOAL 1.0:
Create unique opportunities for a diverse set of students to **contribute** to NASA's work in exploration and discovery.

STRATEGIC GOAL 2.0:
Build a diverse future STEM workforce by engaging students in **authentic learning experiences** with NASA's people, content and facilities.

STRATEGIC GOAL 3.0:
Attract diverse groups of students to STEM through learning opportunities that **spark interest** and **provide connections** to NASA's mission and work.

NASA's unique contributions are vital to attracting the next generation of STEM professionals who will continue the nation's legacy of exploration and discovery.

STEM ENGAGEMENT BENEFICIARIES

NASA's work in STEM Engagement is focused on ultimately serving students. It is recognized that providing support and resources to educators and educational institutions is vital to effectively engage students.

Ultimately, the beneficiaries of NASA's investments and work in STEM Engagement are students in grades K-12, undergraduate and graduate levels.

K-12

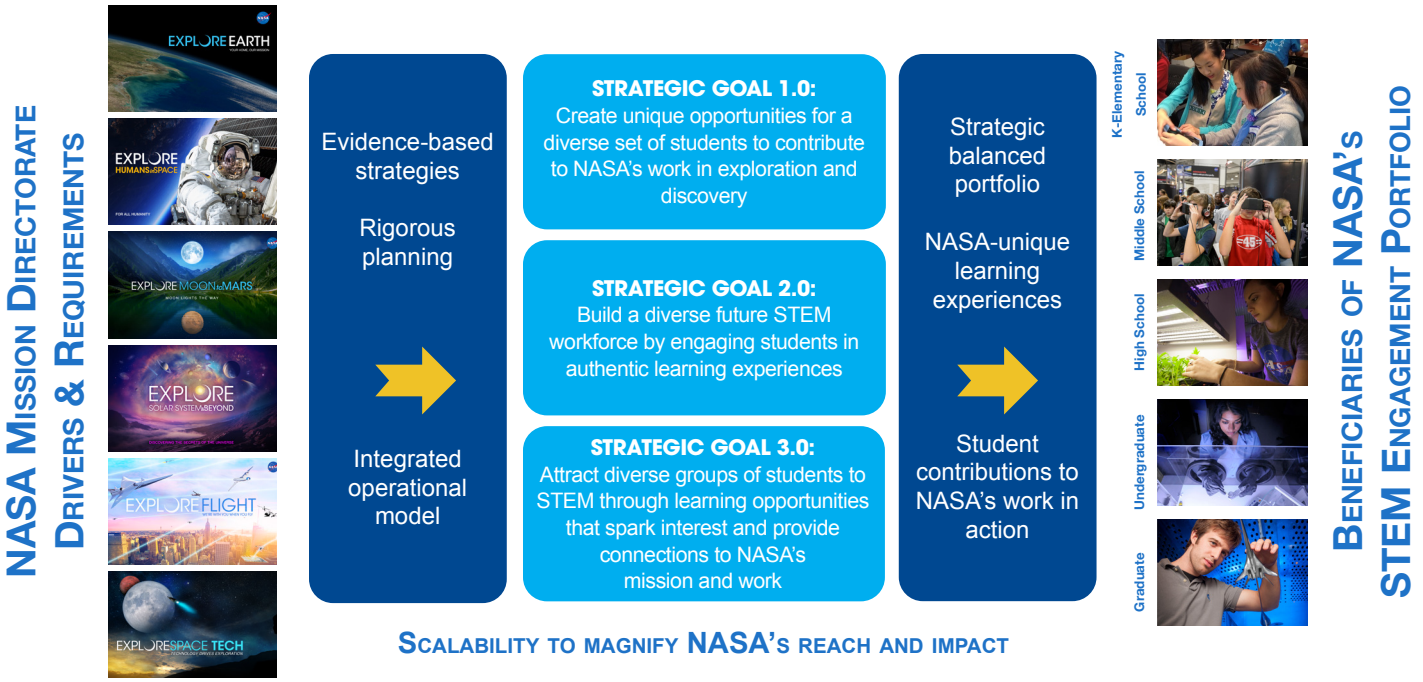
UNDERGRADUATE

GRADUATE

STEM ENGAGEMENT ARCHITECTURE

Central to this strategy, our architecture is designed to enable relevant student contributions to NASA's mission and work, which relies on mission drivers and requirements from NASA's Mission Directorates. This will facilitate alignment of the appropriated STEM Engagement program, as well as existing and emerging relevant projects, activities and products across the Agency, resulting in a framework and strategy with more effective and coherent approaches and outcomes.

NASA STEM Engagement Architecture
Enabling Student Opportunities & Contributions



STRATEGIC GOALS, OBJECTIVES AND STRATEGIES

STRATEGIC GOAL 1.0: Create unique opportunities for a diverse set of students to contribute to NASA's work in exploration and discovery.

OBJECTIVES:

1.1 Provide student work experiences that enable students to contribute to NASA's missions and programs, embedded with NASA's STEM practitioners.

1.2 Create structured and widely-accessible, experiential learning opportunities for students to engage with NASA's experts and help solve problems that are critical to NASA's mission.

STRATEGIC GOAL 2.0: Build a diverse future STEM workforce by engaging students in authentic learning experiences with NASA's people, content and facilities.

OBJECTIVES:

2.1 Develop and deploy a continuum of STEM experiences through authentic learning and research opportunities with NASA's people and work to cultivate student interest, including students from underrepresented and underserved communities, in pursuing STEM careers and foster interest in aerospace fields.

2.2 Design the portfolio of NASA STEM engagement opportunities to contribute toward meeting Agency workforce requirements and serving the nation's aerospace and relevant STEM needs.

STRATEGIC GOAL 3.0: Attract diverse groups of students to STEM through learning opportunities that spark interest and provide connections to NASA's mission and work.

OBJECTIVES:

3.1 Develop and deploy targeted opportunities and readily available NASA STEM engagement resources and content, to attract students to STEM.

3.2 Foster student exposure to STEM careers through direct and virtual experiences with NASA's people and work.

Strategies We Will Employ Toward Achieving Our Strategic Goals	
Higher Education	1. Provide internships, fellowships, and other experiences for students to conduct scientific and technical research and perform design and development activities to fulfill NASA needs and priorities. 2. Create challenges, competitions and other transdisciplinary experiential learning opportunities to enhance STEM student studies.
K-12	1. Develop and deploy evidence-based opportunities to engage students in NASA-unique learning experiences beyond the classroom. 2. Enhance student STEM experiences in schools and other educational venues, using evidence-based strategies, NASA STEM practitioners, learning opportunities, content and resources. 3. Create and deploy authentic learning experiences and research opportunities for students to bolster their STEM studies and stimulate further interest and achievement.
Institutional and Educator Support	1. Create mission-driven opportunities and collaborative initiatives that enable institutions to conduct innovative research, design and technology development to address discrete NASA needs. 2. Provide direct support to colleges and universities to strengthen research and development capacity and capabilities that stimulate contributions critical to NASA's mission. 3. Provide competitive opportunities for informal educational institutions and networks to reach and engage students.
Cross-Cutting	1. Build and sustain a network of strategic partnerships with industry, educational institutions and informal education organizations to enhance the impact of NASA's investments and drive delivery of NASA STEM engagement services and products. 2. Increase visibility of and accessibility to NASA's portfolio of STEM engagement opportunities and activities to broaden participation through the use of innovative media tools and platforms. 3. Cultivate and develop opportunities to leverage NASA's STEM workforce, to actively participate in the Agency's STEM engagement activities, and serve as mentors and role models. 4. Engage NASA human capital and aerospace industry leaders to identify workforce trends and mission priorities to influence the direction of current and future programming.

STEM ENGAGEMENT DESIGN PRINCIPLES

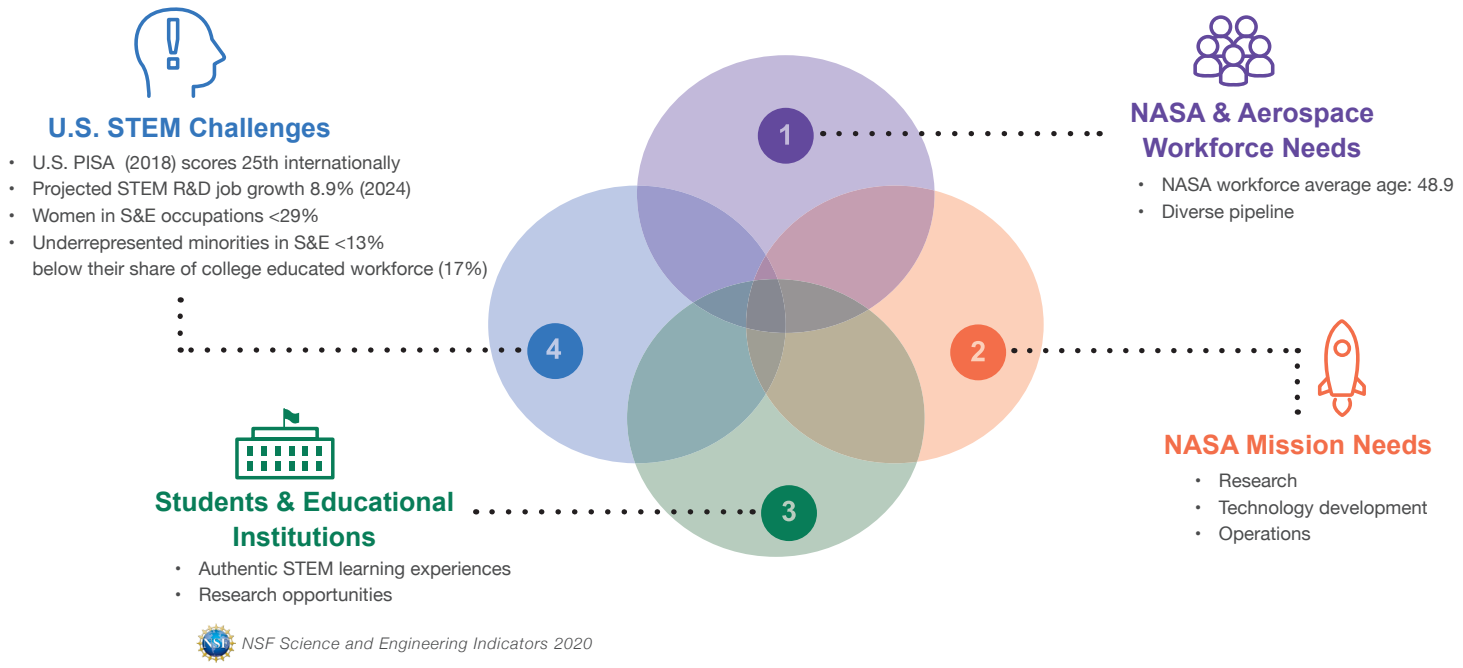
At the core of NASA's efforts in STEM Engagement are the following cross-cutting design principles. These principles guide the STEM engagement community in the planning and execution of work in direct support of achieving the objectives.

Design Principle	Definition
Mission-driven authentic STEM experiences	Design experiential opportunities, design and development activities, research experiences, and/or products to enable students to 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	Use guidelines, strategies, frameworks, and proven 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.
Outcome-driven	Establish outcomes and define corresponding metrics and measures to demonstrate success.

STEM ENGAGEMENT IN THE CONTEXT OF NASA'S MISSION

Given the state of the nation's STEM workforce and projected demands in order to meet future needs, NASA clearly has a vested interest in helping to prepare and attract its future STEM professionals. Recent national and international tests show that in the last decade, U.S. students have demonstrated little or no growth in mathematics and remain ranked in the middle of advanced economies on international science and mathematics assessments[1]. The number of women and underrepresented minorities earning STEM degrees has grown in broad science and engineering occupations over the last decade, however significant underrepresentation remains in areas critical to NASA like engineering and computer and mathematical sciences[2]. Building upon strategies and design principles identified in the STEM Engagement Strategy, NASA is positioned within the nation's STEM ecosystem to collaborate with other federal agencies, state and local government, industry, institutions and the non-profit sector to contribute to a shared goal of a globally competitive workforce.

NASA's unique contributions are vital to attracting and building a vibrant and diverse next generation STEM workforce that will continue the nation's legacy of exploration and discovery. To execute its STEM engagement efforts, NASA will leverage its community of talented and dedicated education professionals, and its technical workforce, who together can inspire and engage youth and students in STEM.



NASA's Contributions to the STEM Ecosystem

[1] Science Board, National Science Foundation. 2020. Science and Engineering Indicators 2020: The State of U.S Science and Engineering. NSB-2020-1. Alexandria, VA. Available at https://ncses.nsf.gov/pubs/nsb20201/.

[2] National Science Foundation, National Center for Science and Engineering Statistics. 2019. Women, Minorities, and Persons with Disabilities in Science and Engineering: 2019. Special Report NSF 19-304. Alexandria, VA. Available at https://www.nsf.gov/statistics/wmpd.

SUMMARY

Over the next three years, NASA is committed to defining and implementing a portfolio of STEM Engagement programs, projects, activities and products directed toward achieving the objectives and strategies above, driving a coherent and coordinated set of activities across the Agency. Ultimately, the work dedicated to this strategy will contribute to achieving NASA's STEM Engagement vision to immerse students in NASA's work, attract students to STEM, and inspire the next generation to explore.

NASA's bold mission and the nature of its innovative and pathfinding endeavors have the potential to inspire and engage youth and students to dream and pursue amazing goals. NASA is making valuable contributions to the federal sector's goals for STEM education by providing mission-driven opportunities that will attract students to STEM and help build a vibrant and diverse next generation STEM workforce.

Imagine America's young people not only excited about their space program and more knowledgeable of our nation's work in air and space, but as a result of NASA's STEM Engagement efforts, mobilized to pursue STEM careers and actively engaged in working toward being scientists, engineers, explorers and astronauts.

National Aeronautics and Space Administration

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www.nasa.gov/centers/hq

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The Next Generation of Explorers

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NP-2020-05-2856-HQ