

# INSPIRE - ENGAGE - EDUCATE - EMPLOY

## The Next Generation of Explorers



# NASA OFFICE OF STEM ENGAGEMENT UPDATE

MIKE KINCAID  
ASSOCIATE ADMINISTRATOR FOR STEM ENGAGEMENT

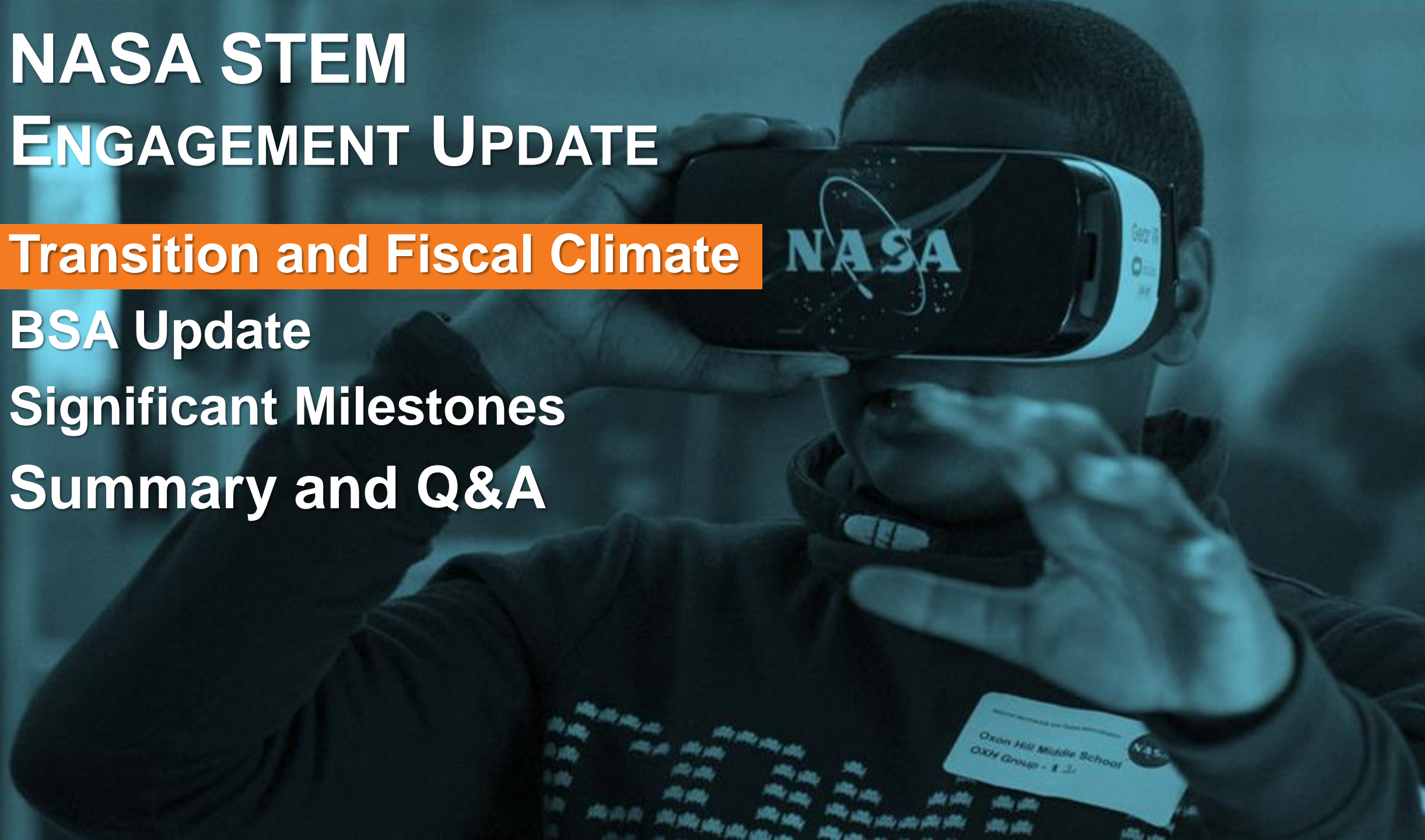
# NASA STEM ENGAGEMENT UPDATE

Transition and Fiscal Climate

BSA Update

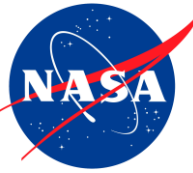
Significant Milestones

Summary and Q&A



# VISION & MISSION

National Aeronautics and  
Space Administration



## Vision:

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

## Mission:

We engage the nation in NASA's mission

### FOCUS AREAS



Create **unique opportunities** for students and the public 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.

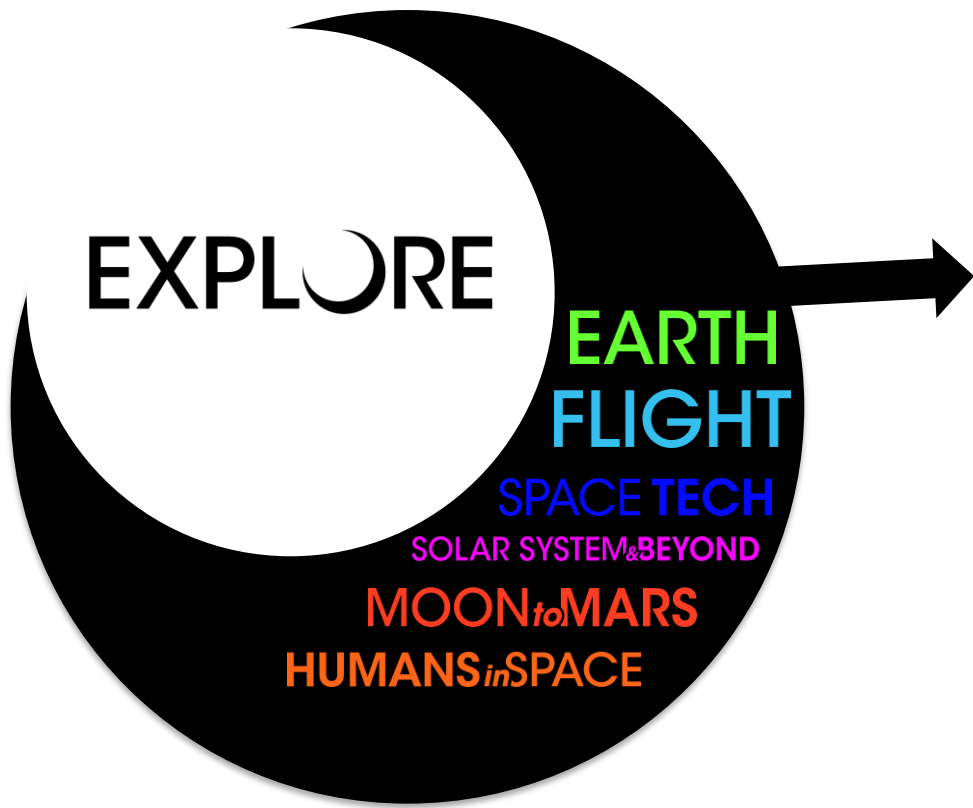


Strengthen **public understanding** by enabling **powerful connections** to NASA's mission and work.



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# MISSION-DRIVEN STRATEGIC ENGAGEMENT

# STEM Learning Ecosystem

National Aeronautics and  
Space Administration

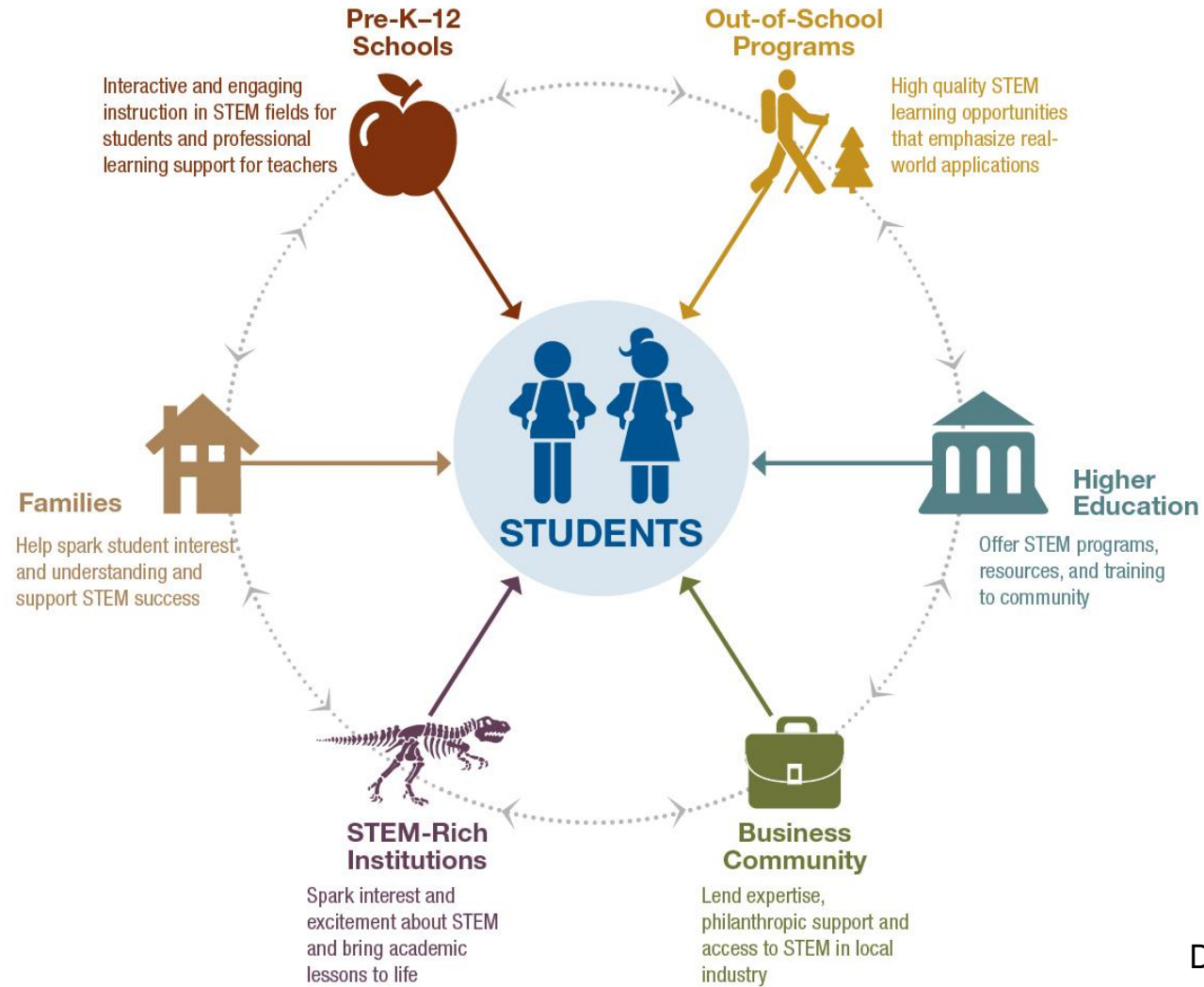
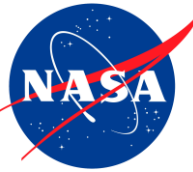
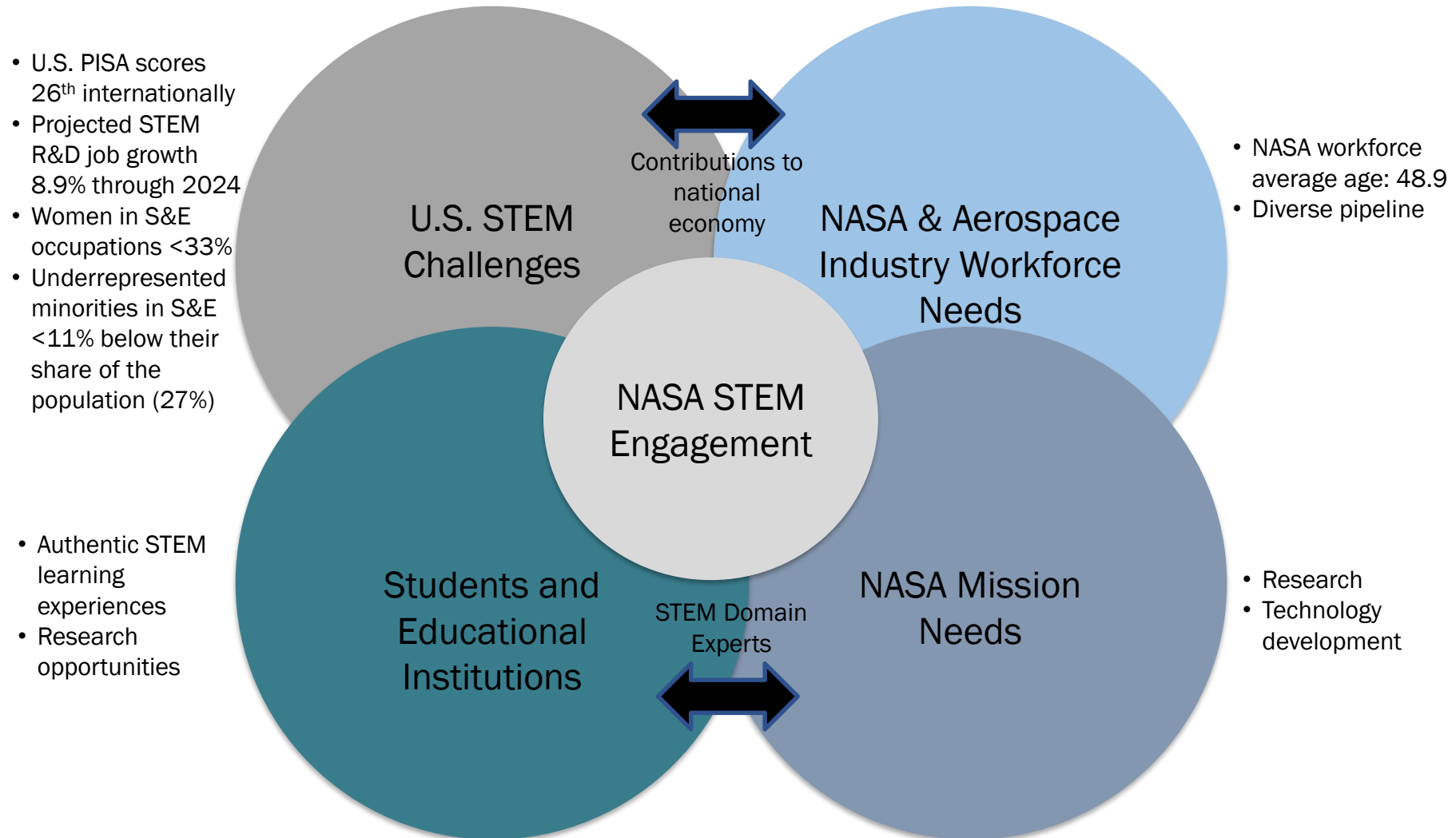


Image Credited to U.S.  
Department of Education

# NASA's Contributions to the STEM Ecosystem

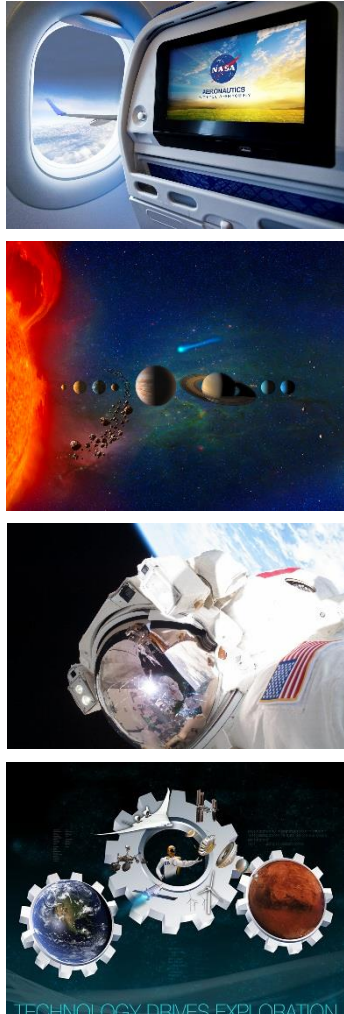


# Our STEM Engagement Roadmap

## *Establish an agency STEM Engagement strategy and an operational model*

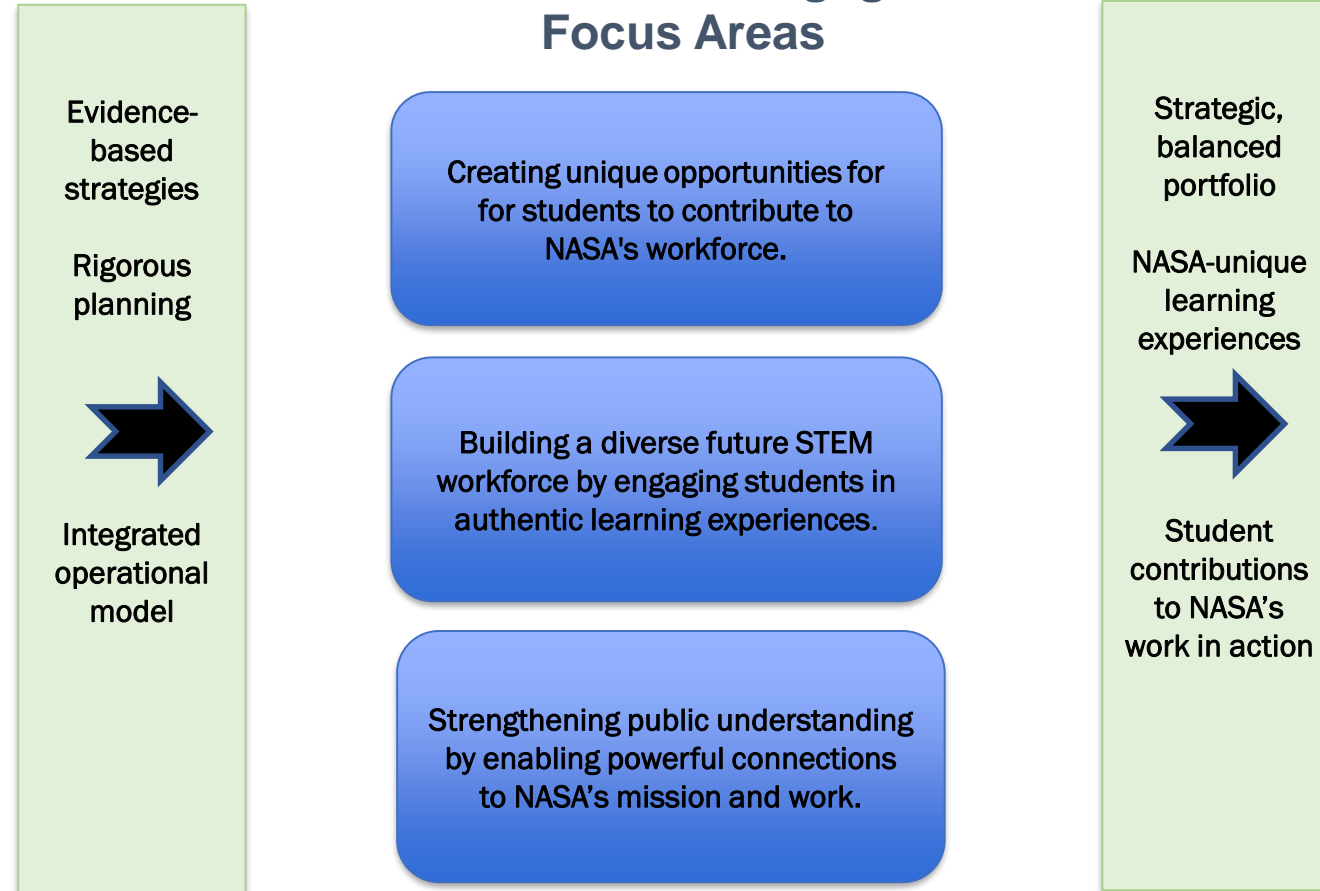
- An agency vision, mission and strategy, to frame and align the agency's STEM engagement portfolio will:
  - Focus on students as beneficiaries and structured model
  - Be mission-driven architecture for scope and approach
  - Focus on evidence-based NASA-unique learning experiences enabling student contributions to NASA's work in action
- Effective, integrated governance via STEM Engagement Council
- Re-invigorated agency function and HQ functional office
- Rigorous planning process
- Integrated operational model and agency STEM Engagement portfolio
- Effective program and fiscal management
- Capabilities driven approach for agency roles and responsibilities
- New approach and tools for performance measurement and assessment
- Scalability and magnified impact through strategic partnerships

## NASA Mission Directorate Drivers & Requirements



# New Architecture Enabling Student Opportunities & Contributions

## STEM and Public Engagement Focus Areas



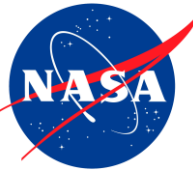
Scalability to magnify NASA's reach and impact





# Fiscal Climate

National Aeronautics and  
Space Administration



| \$M         | FY 2017 | FY 2108 | FY 2019     |                     |                      |
|-------------|---------|---------|-------------|---------------------|----------------------|
|             | Actual  | Actual  | President's | House<br>(Proposed) | Senate<br>(Proposed) |
| Space Grant | 40.00   | 40.00   | 0.00        | 40.00               | 40.00                |
| MUREP       | 32.00   | 32.00   | 0.00        | 32.00               | 32.00                |
| EPSCoR      | 18.00   | 18.00   | 0.00        | 18.00               | 18.00                |
| SEAP        | 10.00   | 10.00   | 0.00        | --                  | 10.00                |
|             |         |         |             |                     |                      |
| TOTAL       | 100.00  | 100.00  | 0.00        | 90.00               | 100.00               |

A young person with short dark hair, wearing a white t-shirt, is speaking into a microphone. They are holding a piece of paper. The background is a large, out-of-focus crowd of people, mostly young adults, seated in an auditorium. The entire image has a blue color overlay.

# NASA STEM ENGAGEMENT UPDATE

## Transition and Fiscal Climate

### BSA Update

## Significant Milestones

## Q&A

# STEM Engagement BSA Implementation Phase FY2018 Milestones

National Aeronautics and  
Space Administration



|                    | 90 Days<br>January – March 2018                                                                                                                                                                                                                                                                                                                                                                                                         | 180 Days<br>April – June 2018                                                                                                                                                                                                                                                                                                                                                                                                        | 270 Days<br>July – September 2018                                                                                                                                                                                                                         |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Governance         | <ul style="list-style-type: none"> <li>✓ Gain approval for STEM Engagement Council (SEC)</li> <li>✓ Define charter and establish SEC</li> <li>✓ Develop STEM Engagement NPD</li> <li>✓ Develop STEM Engagement scope and definitions</li> <li>✓ Define STEM Engagement functional elements</li> <li>✓ Define Office of STEM Engagement structure</li> <li>✓ Conduct analysis of existing infrastructure, tools &amp; systems</li> </ul> | <ul style="list-style-type: none"> <li>✓ Initiate and conduct SEC operations</li> <li>✓ Establish STEM Engagement NPD</li> <li>✓ Establish STEM Engagement function</li> <li>✓ Establish Office of STEM Engagement</li> <li>• Initiate efforts to build STEM Engagement Community of Practice</li> <li>✓ Establish SEC functional working groups</li> </ul>                                                                          | <ul style="list-style-type: none"> <li>• Complete transition to new Office of STEM Engagement</li> <li>• Joint SEC-CCC efforts to ensure alignment and progress on BSA implementation</li> <li>• Develop an approach to strategic partnerships</li> </ul> |
| Program Management | <ul style="list-style-type: none"> <li>✓ Conduct stakeholder discussions</li> <li>✓ Research agency metrics approach</li> <li>✓ Develop integrated master schedule</li> <li>✓ Research and initiate capabilities assessment</li> <li>✓ Perform programmatic baseline assessment</li> <li>✓ Initiate communications approach</li> </ul>                                                                                                  | <ul style="list-style-type: none"> <li>✓ Develop and establish agency Strategic Implementation Plan, including goals and strategies</li> <li>✓ Develop agency metrics approach</li> <li>• Develop annual planning cycle</li> <li>• Complete capabilities assessment</li> <li>• Conduct integrated program assessment</li> <li>• Develop communications strategy</li> <li>• Establish STEM engagement implementation teams</li> </ul> | <ul style="list-style-type: none"> <li>• Put processes in place for oversight and integration</li> <li>• Establish and implement agency metrics approach</li> <li>• Establish annual planning cycle</li> </ul>                                            |
| Grants Management  | <ul style="list-style-type: none"> <li>✓ Conduct assessment of grants management fiscal performance and practices.</li> <li>✓ Put in place initial changes in fiscal practices and operational approach.</li> </ul>                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>✓ Develop financial performance metrics and accountability measures</li> </ul>                                                                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>• Establish dedicated grants website</li> </ul>                                                                                                                                                                    |



A young boy with dark hair, wearing a dark shirt with NASA patches, is looking up and reaching out towards a large, white, segmented model of a hand. The background is a blurred indoor space with other people. The entire image has a blue tint.

# NASA STEM ENGAGEMENT UPDATE

## Transition and Fiscal Climate BSA Update

### Significant Milestones

### Q&A



# National Space Grant and Fellowship Program (Space Grant)

## NASA Mission Directorate Drivers & Requirements

### At A Glance

- 52 state-based consortia
- 850 Affiliate members
- Incorporates State priorities, needs, and goals

### Elements of the Approach

- Mission Directorate Collaborations
- Strategic Partnership with NASA Centers
- Education, Research, and Informal Education Opportunities
- State-based Consortia Partnerships

### Impact

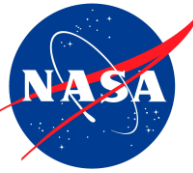
- Contribute to solving Mission Directorate challenges
- Increase collaboration and engagement with Space Grant and NASA Centers
- Increase NASA related skills and diversity in the Nations STEM workforce
- Publicize and Promote NASA's accomplishments and missions across the Nation



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# Space Grant Update

National Aeronautics and  
Space Administration



- 225 intern placements in 2018 across 52 consortia
- Southern Regional Education Board 2018 (10/25-28)
  - Office of STEM Engagement will sponsor 10 students
- Participating in NASA's collaboration with various industry and academic partners to celebrate NASA's 60<sup>th</sup> Anniversary in Space



# New Minority University Research and Education Project (MUREP) Engagement

## NASA Mission Directorate Drivers & Requirements

### At A Glance

- Limited to Minority-Serving Institutions
- Responsive to Presidential Executive Orders
- Portfolio includes 7 funded activities

### Elements of the Approach

- Student Opportunities
- MSI Partnerships and Sustainability
- Mission Directorate Collaborations
- K-12 Engagement

### Impact

- Contribute to solving Mission Directorate problems
- Increased STEM Awareness
- Increase retention of Underserved and Underrepresented groups in STEM
- Enhance MSI infrastructure
- Enable MSI sustainability

# Recent MUREP Awards

## MUREP Innovations in Space Technology Curriculum (MISTC)

*Help schools establish new courses that contribute to preparation, training and development of NASA's future workforce.*

- Bronx Community College (Bronx, New York)
- College of the Desert (Palm Desert, California)
- Los Angeles Pierce College (Woodland Hills, California)
- Passaic County Community College, Patterson, New Jersey
- Prince George's Community College, Upper Marlboro, Maryland

## MUREP Aerospace Academy (MAA)

*Build interest, skills and knowledge necessary for K-12 students to pursue STEM careers*

- Albany State University (Albany, Georgia)
- California State University (Fresno, California)
- Elizabeth City State University (Elizabeth City, North Carolina)
- Navajo Technical College (Crownpoint, New Mexico)
- Tennessee State University (Nashville, Tennessee)
- Texas State University (San Marcos, Texas)
- The University of Texas (El Paso, Texas)

## MUREP for Sustainability and Innovation Collaborative (MUSIC)

*Communicate and encourage best practices, capabilities and opportunities amongst Minority Serving Institutions enabling MSI fiscal sustainability*

- Alabama A&M University (Huntsville, AL)
- The Quality Education for Minorities (QEM) Network (Washington, DC)
- University of Hawai'i at Manoa (Hawaii)



# Established Program to Stimulate Competitive Research (EPSCoR)

## NASA Mission Directorate Drivers & Requirements

### At A Glance

- 27 Eligible States and Territories
- Incorporates State priorities, needs, and goals

### Elements of the Approach

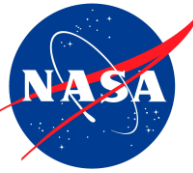
- NASA Aligned University Research Opportunities
- ISS Flight Opportunities
- State Research Infrastructure Development

### Impact

- Expand universities' NASA unique knowledge base
- Enhance state's NASA specific research capabilities
- Promote NASA associated innovations
- Publicize NASA EPSCoR exclusive research results and activities
- Produce NASA qualified STEM workforce

# EPSCoR 2018 Activities

National Aeronautics and  
Space Administration



- Conducting ISS Flight Opportunity Solicitation
- Conducting a Research Infrastructure Development (RID) Solicitation
- Conducting a Basic Research Solicitation
- Conducting Rapid Response Research (R3) Solicitation
- Held All-Agency (EICC) EPSCoR Director's Meeting in DC
- Held 2018 EPSCoR Director's National Meeting in Greenbelt, MD
- Held Technical Interchange Meeting with GSFC
- Implemented an EPSCoR/MIRO Collaboration Project



**Established Program to  
Stimulate Competitive Research  
(EPSCoR)**



EPSCoR funded research assistant analyzes impact of 9 years of space radiation on light fixture materials from the ISS for the EPSCoR Rapid Response Research Project



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# STEM Education and Accountability Projects (SEAP) / NextGen STEM Project

## NASA Mission Directorate Drivers & Requirements

### At A Glance

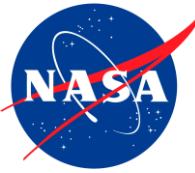
- Investments in formal and informal education communities
- Expanded ability to provide richer, more comprehensive STEM engagement opportunities

### Elements of the Approach

- Mission Directorate Collaborations
- NASA-unique Student Projects and Challenges
- Educator Engagement
- Evidence-based Audience Needs
- Strategic Partnerships

### Impact

- Contribute to solving Mission Directorate challenges
- Leverage Center skills and capabilities
- Increase STEM Skills and Identity
- Enabling scalable Partnerships to increase NASA's reach



# How Does Next Gen STEM Enable Agency Success?

- Funds mission-driven initiatives with informal educational institutions and sustains NASA's Museum Alliance.
- Pilots new and unique opportunities to stimulate STEM engagement and learning experiences.
- Provides capacity to balance our agency STEM engagement portfolio – fills gaps.
- Target and engage with appropriate strategic partners (federal, non-profit, industry) to scale opportunities.
- Sustains capabilities and human resources at NASA Centers that provide students direct access to NASA's STEM domain experts, facilities and unique experiences.

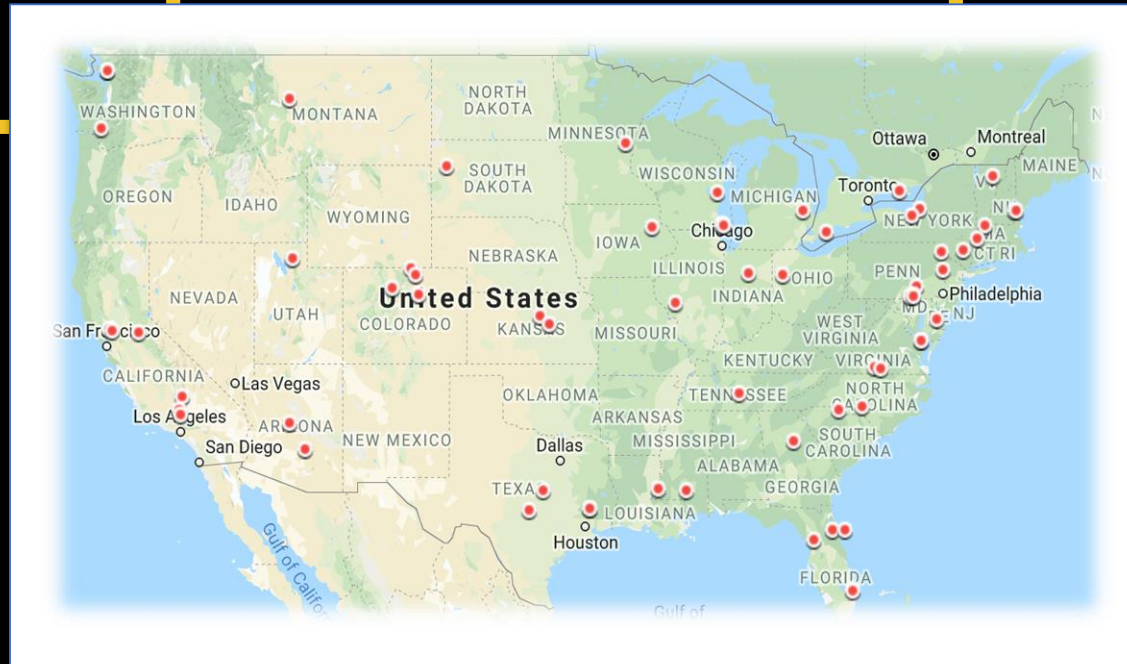




# TEAM II / CP4SMPVC\* AWARDS 2008-2018

85 Grants and  
Cooperative Agreements

Over \$56.6M  
awarded



\*Competitive Program for Science Museums, Planetariums, and Visitors Centers

# Teams Engaging Affiliated Museums and Informal Institutions (TEAM II)

Three selected in 2018

## **“Small Steps to Giant Leaps” 50<sup>th</sup> Apollo 11 Landing Anniversary theme**

Kansas Cosmosphere

Apollo Redux: Inspiring Next Generations of Engineers and Scientists through use of Historic Mission Operation Control Room Consoles and Simfault Interactive Programs

Arizona Science Center

The Moon and Beyond: An Immersive Game for STEM Learning in Museums and Planetariums.

## **“Beyond Low-Earth Orbit” theme**

Fairchild Tropical Garden

Growing Beyond Earth Innovation Studio.







# Year of Education on Station (YES!)

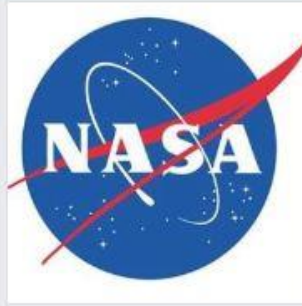
**58 DOWNLINKS** reaching  
**162,000 STUDENTS**  
And **38,000 TEACHERS**

**65 TOTAL PLANNED**  
by Oct 3 (end of YES)

Driven a **30.2% increase** in  
traffic to STEM on Station  
website

**53,071 views per month**  
40,749 in the same period  
before YES

# Social Engagement with YES



NASA Students

Home

Posts

Photos

About

Community

Info and Ads

Create a Page



Like Follow Share ...

Posts



NASA Students

1 hr · 🌐

**Space to Ground** episode (Christa's Lost Lessons)

Over 3,000 views on Youtube

1800 mentions on Twitter

**#TeacheronBoard**

Used over 13,000 times during YES

Total reach of 748m viewers

**#STEMonStation**

Used 8,600 times

Total Reach of 532m viewers

Teacher appreciation week:

**NASA's #thankateacher** was mentioned on social media in 2,800 times in one week.

Community

See All

Invite your friends to like this Page

73,054 people like this

73,056 people follow this

About

See All

Government Organization

Suggest Edits

Related Pages



Watch this Space with ...

Show

Like



**NASA Technology**  
Government Organization

Like



**NASA Astronauts**  
Education

Like





# STEMONSTRATIONS

National Aeronautics and Space Administration

**STEMonstrations**  
Education in Action on the International Space Station

**Classroom Connections**

**Newton's Second Law**

For more STEMonstrations and Classroom Connections, visit [www.nasa.gov/stemonstration](http://www.nasa.gov/stemonstration).

### Air Powered Mass: $F=ma$

Teacher Background

Grade Level: 6<sup>th</sup>-8<sup>th</sup>

**Suggested Time: 90 Minutes**  
Inquiry Activity (10 minutes); STEMonstrations Video and discussion (5 minutes); Student Activity (25 minutes); Students generate adaptations and repeat (25 minutes); Final Discussion / Sharing results (15 minutes)

**Next Generation Science Standards (NGSS):**  
**MS-PS2-2.** Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

**Disciplinary Core Ideas:** PS2.A: Forces and Motion – The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of time. In order to share information with other people, these choices must also be shared.

**Crosscutting Concepts:** Stability and Change – Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales.

**Science and Engineering Practices:** Planning and carrying out investigations – Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.

**Background**

Newton's Second Law of Motion plays an important role in space exploration – it gets our rockets off the ground! This law relates force, mass, and acceleration and is often written as the equation  $F=ma$  ( $F$ =force,  $m$ =mass, and  $a$ =acceleration). This equation tells us that an object with more mass requires a larger force to accelerate than an object with less mass. That means a rocket with a lot of mass needs a stronger force to help it accelerate and get off the ground than a rocket with a smaller mass.

**Objective**

Following this activity, students will be able to:

- Explain Newton's Second Law of Motion and the relationship among force, mass, and acceleration.

Students will test how an equal force impacts an object's acceleration as its mass increases. They will make a paper car that uses wind power (air pump) to propel forward. The car will ride along a track made from straws to simulate motion in one dimension. They will repeat these steps for multiple trials while adding mass each time. By collecting and recording data, students should notice a trend, and use their data to prove Newton's Second Law of Motion. Extensions include making adaptations to the car or even generating an entirely new design, while comparing their results to the test design.

**Inquiry Discussion**

Start this lesson by letting students explore Newton's Second Law through inquiry. Provide students with objects of varying masses, and direct them to their Inquiry Activity worksheet (page 4) for directions. Use the following questions to help guide discussions after students have completed the inquiry activity.

- When you used the tape measure to reel in objects of different mass, what did you observe?
- How does mass affect the change of motion of an object when it is pushed/pulled?

**STEMonstrations Video**

Show the STEMonstrations video: Newton's Second Law. This video is available at [www.nasa.gov/stemonstrations](http://www.nasa.gov/stemonstrations).

**Post-Video Discussion**

Following the video, ask the students to reflect upon how the demo might look when performed on Earth. In the STEMonstrations video, you see NASA Astronaut Randy Bresnik applying the same force to three different objects of varying mass: a stick of lip balm, an Orion spacecraft model, and a large cargo transfer bag (CTB). Were you able to see how the objects accelerated differently? This difference is due the equation associated with Newton's Second Law of Motion, shown below.

**Force = mass x acceleration ( $F=ma$ )**

Discuss how this compares to their inquiry activity. What did they observe?

Student Data Sheet

Group Members: \_\_\_\_\_

| Items                 | Total Mass (g) | Distance Car Traveled (cm) |        |        |        | Average |
|-----------------------|----------------|----------------------------|--------|--------|--------|---------|
|                       |                | Test 1                     | Test 2 | Test 3 | Test 4 |         |
| Car + Cup +0 pennies  |                |                            |        |        |        |         |
| Car + Cup +5 pennies  |                |                            |        |        |        |         |
| Car + Cup +10 pennies |                |                            |        |        |        |         |
| Car + Cup +15 pennies |                |                            |        |        |        |         |

Plot a bar graph depicting the average distance of the four tests for each mass:

**Analyze results**

- Explain the effect mass has on distance traveled. Does your data support Newton's Second Law of Motion?
- Were your initial predictions in "Think About It" correct? Why or why not?

**Extension Questions**

- What adaptations could be made to the car to improve upon its design?
  - Design and implement an adaptation using additional materials provided by your instructor.
  - Repeat your procedures using your new design. What differences did the new design have on your results?
- How does Newton's Second Law of Motion affect astronauts aboard the International Space Station?

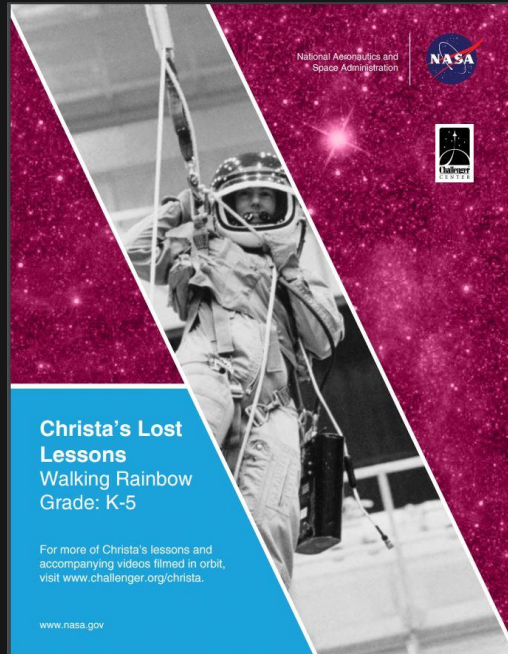
STEMonstrations Classroom Connection: Newton's Second Law | 6

**CLASSROOM CONNECTIONS**  
Available for free:  
[nasa.gov/STEMonstrations](http://nasa.gov/STEMonstrations)

# Christa's Lost Lessons

Honoring Christa and  
teachers everywhere in  
partnership with The  
Challenger Center

[www.challenger.org/christa](http://www.challenger.org/christa)



A man with glasses, wearing a white lab coat and a grey apron, is working in a laboratory. He is holding a small vial and looking down at it. The background is a blue-tinted image of a laboratory setting with various equipment and a sign that reads "EXPLORE".

# NASA STEM ENGAGEMENT UPDATE

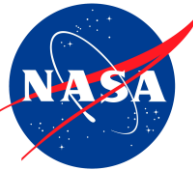
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Significant Milestones:

**Summary and Q&A**





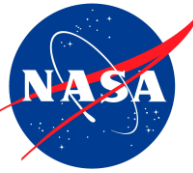
# Summary

- STEM Engagement – What's NEW??
  - Agency strategy and portfolio aligned with mission focus areas and strategic objectives and outcomes
  - Mission-driven investments and activities
  - Focus on students as beneficiaries:
    - Evidence-based, authentic learning experiences
    - Contributions to NASA's work and mission
  - Scalability via strategic partnerships
  - Sustainable approach to performance measurement
- Solicitations awarded across all Major Programs
- Upcoming Space STEM Forum, Sept. 19



# Space STEM Forum

National Aeronautics and  
Space Administration



***Small Steps to Giant  
Leaps, Looking  
Forward to the  
Future of Space  
Exploration***

## Space STEM Forum:

NASA HQ on Sept. 19, 2018, 9:00 am-4:30 pm

## Forum Theme:

*Small Steps to Giant Leaps, Looking Forward to the Future of Space Exploration*

## Purpose:

Identify opportunities to collaborate and leverage our individual STEM engagement activities and efforts with industry and professional organizations

## Abstracts:

Approximately 22 abstracts will be selected, with about 16 involving national efforts/projects and about 6 on resources and capabilities

## Website:

Collaborative work website and public website will be created to facilitate implementation of outcomes



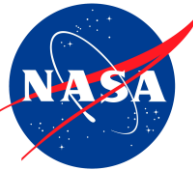
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# QUESTIONS?





# INSPIRE - ENGAGE - EDUCATE - EMPLOY

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# THANK YOU!