NASA Marshall Space Flight Center Education Program Overview
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NASA Education Vision Statement

To advance **high quality** science, technology, engineering, and mathematics (STEM) education using **NASA’s unique** capabilities.
**Strategic Goal 5:** Enable program and institutional capabilities to conduct NASA’s aeronautics and space activities.

- Outcome 5.1: Identify, cultivate, and sustain a diverse workforce and inclusive work environment that is needed to conduct NASA missions.

**Strategic Goal 6:** Share NASA with the public, educators, and students to provide opportunities to participate in our Mission, foster innovation, and contribute to a strong national economy.

- Outcome 6.1: Improve retention of students in STEM disciplines by providing opportunities and activities along the full length of the education pipeline.
- Outcome 6.2: Promote STEM literacy through strategic partnerships with formal and informal organizations.
- Outcome 6.4: Inform, engage, and inspire the public by sharing NASA’s missions, challenges, and results.
**Outcomes**

- **Employ**
  - Identify, cultivate, and sustain a diverse workforce and inclusive work environment that is needed to conduct NASA missions.

- **Educate**
  - Attract and retain students in STEM disciplines along the full length of the education pipeline.

- **Engage**
  - Engage the public in NASA’s missions by providing new pathways for participation.

- **Inspire**
  - Inform, engage, and inspire the public by sharing NASA’s mission, challenges, and results.
  - Build strategic partnerships that promote STEM literacy through formal and informal means.

**Operating Principles**

- Relevance
- NASA Content
- Diversity
- Evaluation
- Continuity
- Partnership/Sustainability
Education as a Center Function at MSFC

Office of the Director

Office of Human Capital

Organizational & Leadership Development

Workforce Strategy & Planning

Academic Affairs

Training & Incentives

Human Resources Services

Informal Education

Elementary/Secondary Education and Education Technology (eEducation) & Products

Higher Education and Minority University Research & Education
## Human Capital Integration to Address Workforce Gaps of Top Competency Areas

<table>
<thead>
<tr>
<th>NASA Skill Category</th>
<th>Graduate/Undergraduate Field of Study</th>
<th>National Science, Mathematics and Technology Standards:</th>
<th>NASA Education Project/Product/Activity</th>
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<tbody>
<tr>
<td>Systems Engineering</td>
<td>Industrial, Systems and Software Engineering, Finance, Business, Engineering Management</td>
<td>Science as inquiry, Apply the design process, engineering design, Numbers and operations, Data analysis, probability, and processes, Assess the impacts of products and systems, Problem solving, Communicating science explanations</td>
<td>• NASA Student Launch Projects (includes Student Launch and University Student Launch initiatives)</td>
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<td>• NASA Great Moonbuggy Race</td>
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<tr>
<td>Power &amp; Propulsion</td>
<td>Aerospace and Mechanical Engineering, Physics</td>
<td>Motions and forces, Transfer of energy, Measurement, Energy and power technologies</td>
<td>• NASA Student Launch Projects</td>
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<tr>
<td>Electrical and Electronic</td>
<td>Electrical and Software Engineering, Programming, Computer Science</td>
<td>Information and communication technologies, Abilities of technological design, Understanding about science &amp; technology</td>
<td>• NASA Student Launch Projects</td>
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<tr>
<td>Structures, Materials and</td>
<td>Mechanical, Chemical Structural, and Civil Engineering and Materials Science</td>
<td>Properties and changes of properties, Transportation, construction, and manufacturing technologies</td>
<td>• NASA Student Launch Projects</td>
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<tr>
<td>Mechanics</td>
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<td>• NASA Great Moonbuggy Race</td>
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Ongoing NASA Human Exploration and Operations-funded projects:

- **NASA Great Moonbuggy Race**
  - Student teams design, build, and race two person-powered buggies over simulated lunar terrain
  - Project encourages problem-solving in a team environment
  - Seventy-five (75) teams totaling 525 students and teacher/faculty members competed in the 2012 NASA Great Moonbuggy Race (36 high schools and 39 universities) from 20 states and Puerto Rico, Germany, India, Italy, United Arab Emirates, Russia, and Canada
  - 20th Annual NASA Great Moonbuggy Race will be held on April 27-28, 2013

- **NASA Student Launch Projects**
  - Student teams design, build, and launch a reusable rocket, with scientific payload, to 1-mile in altitude
  - Project engages teams of middle and high school-aged students, selected from the top winning teams in the Team America Rocketry Challenge (TARC) and the Rockets for Schools (R4S) competitions, and university and college teams who compete for awards against their peers
  - Forty-one (41) university-level teams from 25 states and 15 secondary-level teams from 8 states competed in NASA Student Launch during academic year 2011-12 with total engagement over 600 students and teacher/faculty members
  - Seventy (70) schools competed for entry into the FY 2013 project with 57 teams from 26 states selected to participate during academic year 2012-13
  - 2013 Launch Week Activities will be held on April 18-21, 2013
Line of Business: NASA Internships, Fellowships, and Scholarships (NIFS)

• Center Recruiting Plan Development/Execution

• Minority Institution Collaboration Plan Development/Execution

• NASA Academies (education interns)
  • NASA Academy
  • Propulsion Academy
  • Robotics Academy

• Pathways Program Coordination
  • Employment Interns
  • Recent Graduates
  • Presidential Management Fellows
FY12 Geographic Representation of MSFC Intern Program Participants

Intern Total in FY12: 189 with 28% diversity
100 Schools, 36 States, DC and Puerto Rico

Univ of Alaska, Fairbanks 1
Brigham Young Univ
Univ of Utah 1
Univ of Portland 1
Fond du Lac Tribal College
Univ of Minnesota, Twin Cities 1
Purdue Univ 2
Grinnell College 2
Dordt College 2
Univ. of WI, Madison 1
Univ of Dayton
Ohio State Univ 1
Univ of MI, Ann Arbor 2
Western KY Univ 1
Hostos Comm College
Columbia Univ 1
Cornell Univ 1
Rochester Inst of Tech
Stony Brook Univ 1
Univ of Maine 1
Univ of MI, Ann Arbor 2
Penn. State University 2
Drexel Univ 1
Univ of Massachusetts 1
Massachusetts Inst of Tech 1
Brandeis Univ 1
Mt. Holyoke College 1
Williams College 1
Univ of IL, Urbana-Champaign 2
Princeton Univ 1
Univ of MD College Park 1
West Virginia Univ 2
George Washington Univ 2
University of Virginia 1
Old Dominion Univ 2
James Madison Univ 1
Hampton Univ 1
Amer Public Univ Sys 1
California Inst of Tech 1
California State Univ 1
Univ of California, LA 1
Univ of CA, San Diego 1
Mt. San Antonio College 1
Arizona State Univ 1
Embry-Riddle Aero Univ 1
Navajo Technical College 2
New Mexico State Univ 1
Univ of Colorado, Boulder 2
Univ of Colorado, CO Springs 1
Colorado School of Mines 1
Univ of Colorado 1
Louisiana State Univ 1
Loyola Univ 1
Univ of Arkansas 1
Arkansas Tech Univ 1
Arkansas State Univ 1
Rust College
Mississippi State Univ 1
Park Univ 1
St. Louis Univ 2
Pratt View A&M Univ 1
Texas A & M University 2
Texas Southern Univ 3
Univ of Texas at El Paso 7
Univ of TX, Arlington 1
Univ of TX, San Antonio 1
Univ of Arkansas 1
Univ of Central Florida 1
Univ of Miami 1
Emory University 1
Appalachian State Univ 1
NC State Univ 1
Clemson Univ 1
College of Charleston 1
Georgia Institute of Tech. 3
Emory University 1
Embry-Riddle Aeronautical 2
Florida Institute of Tech. 3
Florida State Univ 1
University of Florida 1
Univ of S. Florida 3
Univ of Central Florida 1
Univ of Miami 1
Appalachian State Univ 1
NC State Univ 1
Clemson Univ 1
College of Charleston 1
Georgia Institute of Tech. 3
Emory University 1
Embry-Riddle Aeronautical 2
Florida Institute of Tech. 3
Florida State Univ 1
University of Florida 1
Univ of S. Florida 3
Univ of Central Florida 1
Univ of Miami 1
**Minority-Serving Institutions and Historically Black Colleges and Universities**

Outside the U.S.
Puerto Rico:
Universidad Politecnica de PR 3
Univ of Puerto Rico, Mayaguez 1
Line of Business: Institutional Engagement

- Lead Huntsville/Madison County Chamber of Commerce Education subcommittee of the Workforce Coalition.
  - Center formed an Integrated Stakeholder Coalition for Workforce Development (ISCWD) with membership from academia, industry, government, medical, and media.
    - Focused on workforce development to maintain a technological-edge and to avoid duplication and identify gaps in the integrated system.
    - Aligned community resources to avoid negative impacts of BRAC.
    - Piloted Career/Technical curriculum enhancements in local school systems.
  - Transitioned the ISCWD to the Chamber Workforce Coalition.
    - Center had previously founded the Alabama Math, Science, Technology Education Coalition (AMSTEC).
    - AMSTEC-driven State legislation to enact the Alabama Mathematics, Science, & Technology Initiative (AMSTI) to provide professional development, equipment, materials, and on-site support to teachers.
- Partner with U.S. Space & Rocket Center on intern recruitment/placement and multiple jointly-sponsored activities.
- Support of educational alliances and scientific community resulted in corporate sponsorship, initially from Northrop Grumman but now numerous community partners, for NASA Great Moonbuggy Race.
  - Cancelation of the Moonbuggy project triggered response from faculty and teachers.
    - Endorsed by colleges/universities as an engineering design course and by the Alabama Dept. of Education as pre-engineering curriculum and as a successful skills training program at vocational schools like the Huntsville Center of Technology.
    - Benchmarked by the Kennedy Space Center for development of their Lunabotics Competition.
  - NASA Student Launch also benefits from corporate sponsorship from the ATK Aerospace Group.

In 2009, the National Conference of State Legislators benchmarked MSFC efforts to improve STEM education and in 2007, the National Governors Association benchmarked MSFC as a STEM learning lab.
Line of Business: Educator Professional Development

- MSFC Educator Resource Center Network (Alabama, Arkansas, Iowa, Missouri, and Tennessee)

- Digital Learning Network (National/International)

- HEO-funded (pre-service, in-service and informal) Educator Professional Development (National)

- Reappointment to Alabama State Board for Career Technical Education

- Member (MSFC educator and engineer) of the Alabama Department of Education Engineering Curriculum Development Team
MSFC manages content for the Educators, Students, and Kids sections of the NASA Portal. NASA Educational Technology Services (NETS) project team working with field centers and mission directorates deliver timely content to customers. Metrics for FY 2012 include:

- 1.6 Million Downloads of Educational Products
- 18,500 Subscribers EXPRESS Mailing List
- 7,600 Subscribers Facebook for Students
- 40.6 Million Page Views
- NASA Kids’ Club recognized as a 2012 Best Website for Teaching and Learning by the American Association of School Librarians in the Curriculum Collaboration category
- Questions
- Discussion
The Strategic Plan will provide common goals, outcomes, and strategies to create a coordinated portfolio of STEM education across the Federal government. It requires Federal agencies to design and revise their STEM education investments to accomplish the following objectives:

1. **Do What We Know Works** – Ensure Federal STEM investments utilize what is known about effective STEM education and best practices in STEM education.

2. **Learn More About and Share What Works** – Improve assessment and evaluation of STEM education investments to facilitate continual improvement and tracking of outputs and outcomes.

3. **Increase Efficiency and Cohesion** – Ensure Federal STEM education investments are coordinated to efficiently utilize and leverage Federal resources.

4. **Identify and Focus on Priority Issues** – Effective K-12 STEM Teacher Education, Engagement in STEM, Undergraduate STEM Education, and Serving Groups Traditionally Underrepresented in STEM.
## NASA Education - Model

**Vision:** To advance high quality Science, Technology, Engineering and Mathematics (STEM) education using NASA’s unique capabilities.

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Audience</th>
<th>Outputs</th>
<th>FY 13 Annual Performance Goals</th>
<th>Performance Goals</th>
<th>Objectives</th>
<th>Outcomes</th>
<th>Goals</th>
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</thead>
<tbody>
<tr>
<td>Guidance through Congressional Authorizations</td>
<td>Learners</td>
<td>Experiences</td>
<td>APG 1: Provide significant, direct student awards in higher education to (1) racially or ethnically underrepresented students, (2) females, and (3) persons with disabilities at percentages that meet or exceed national STEM enrollment percentages for these populations, as determined by the most recent, publically available data from the U.S. Department of Education’s National Center for Education Statistics for a minimum of two of the three categories.</td>
<td>5.1.2.1: Ensure that students participating in NASA higher education projects are representative of the diversity of the nation, based on student enrollment data maintained by the U.S. Department of Education’s National Center for Educational Statistics.</td>
<td>5.1: Provide opportunities and support systems that recruit, retain, and develop undergraduate and graduate students in STEM-related disciplines.</td>
<td>6.1: Improve retention of students in STEM disciplines by providing opportunities and activities along the full length of the education pipeline.</td>
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<tr>
<td>Funding through Congressional Appropriations</td>
<td>Educators</td>
<td>Access</td>
<td>APG 2: Maintain no fewer than 1,000 online STEM-based teaching tools for K-12 and informal educators and higher education faculty.</td>
<td>6.1.2.1: Focus resources, including content, facilities, and personnel, to improve the impact of NASA’s STEM education efforts on areas of greatest national need as identified in the 2011 NASA Education Design Team report, ensuring that NASA-unique assets are leveraged when conducting direct-service student activities.</td>
<td>6.1: Provide NASA experiences that inspire student interest and achievement in STEM disciplines.</td>
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<td>Executive Office of the President</td>
<td>Institutions</td>
<td>Competitive Opportunities and Partnerships</td>
<td>APG 3: Conduct no fewer than 200 interactive K-12 student activities that leverage the unique assets of NASA’s missions.</td>
<td>6.1.1.1: Assure the availability and accessibility of NASA’s online curricular support and resources to improve educators’ STEM content knowledge and enhance student interest and proficiency in STEM disciplines.</td>
<td>6.1: Provide quality STEM curricular support resources and materials.</td>
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<td>Education Design Team</td>
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<td>6.1: Improve retention of students in STEM disciplines by providing opportunities and activities along the full length of the education pipeline.</td>
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<td>Education Coordinating Council</td>
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<td>Innovative Pilot Opportunities</td>
<td>APG 4: Participate in no fewer than 20 STEM education advisory boards, STEM-related committees, or other events or activities related to national STEM education policy.</td>
<td>6.2.1.1: Increase NASA’s leadership role in national STEM improvements by focusing on sustainable, meaningful educator professional development and student experiences, adoption of education technologies, and contributions to STEM education policies and strategies.</td>
<td>6.2: Promote STEM literacy through strategic partnerships with formal and informal organizations.</td>
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<td>Sufficiently skilled Education program staff</td>
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<td>Education Networks to Connect Communities of Practice</td>
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<td>6.2.1.2: Develop NASA’s leadership role in national STEM improvements efforts, as demonstrated by provision of meaningful educator professional development and student experiences, adoption of education technologies, and contributions to STEM education policies and strategies.</td>
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<tr>
<td>Appropriate office/facilities for Education programs</td>
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<td>Access and Utilization of NASA’s unique assets and platforms</td>
<td></td>
<td>6.2.1.1: Increase NASA’s leadership role in national STEM improvements by focusing on sustainable, meaningful educator professional development and student experiences, adoption of education technologies, and contributions to STEM education policies and strategies.</td>
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<tr>
<td>NASA Subject Matter Experts</td>
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<td>Web infrastructure and distribution networks</td>
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<td>6.2.1.1: Increase NASA’s leadership role in national STEM improvements by focusing on sustainable, meaningful educator professional development and student experiences, adoption of education technologies, and contributions to STEM education policies and strategies.</td>
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<td>NASA Facilities</td>
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<td>6.4.1.1: Continue to provide opportunities for learners to engage in STEM education through NASA content provided to informal education institutions.</td>
<td>6.4: Inform, engage and inspire the public by sharing NASA’s mission, challenges, and results.</td>
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<td>Strategic Partners</td>
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<td>6.4.1: Use strategic partnerships with formal and informal educational organizations to provide NASA content to promote interest in STEM.</td>
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### Assumptions
- APG 1: Provide significant, direct student awards in higher education to (1) racially or ethnically underrepresented students, (2) females, and (3) persons with disabilities at percentages that meet or exceed national STEM enrollment percentages for these populations, as determined by the most recent, publically available data from the U.S. Department of Education’s National Center for Education Statistics for a minimum of two of the three categories.
- APG 2: Maintain no fewer than 1,000 online STEM-based teaching tools for K-12 and informal educators and higher education faculty.
- APG 3: Conduct no fewer than 200 interactive K-12 student activities that leverage the unique assets of NASA’s missions.
- APG 4: Participate in no fewer than 20 STEM education advisory boards, STEM-related committees, or other events or activities related to national STEM education policy.
- APG 5: Maintain the NASA Museum Alliance in no fewer than 30 states, U.S. territories and/or the District of Columbia.

### Challenges
- The Challenge of Diversity: Assuring that students participating in NASA higher education projects are representative of the diversity of the nation, based on student enrollment data maintained by the U.S. Department of Education’s National Center for Education Statistics.
- The Challenge of Access: Assuring the availability and accessibility of NASA’s online curricular support and resources to improve educators’ STEM content knowledge and enhance student interest and proficiency in STEM disciplines.
- The Challenge of Inclusive Workforce: Cultivating and enabling opportunities and support systems that recruit, retain, and develop undergraduate and graduate students in STEM-related disciplines.

### External Factors
- Funding through Congressional Appropriations
- Executive Office of the President
- Education Design Team
- Education Coordinating Council
- Sufficiently skilled Education program staff
- Appropriate office/facilities for Education programs
- NASA Subject Matter Experts
- NASA Facilities
- Strategic Partners

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Evaluation (throughout Programs)