

MOTIVATING UNDERGRADUATES IN SCIENCE AND TECHNOLOGY (MUST)

Administered by the Hispanic College Fund, Inc.
Type of Agreement: Cooperative Agreement

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Data provided in this update may be found in two reports developed by MPR Associates, “Motivating Undergraduates in Science and Technology: 2011 Annual Report ” and in the “2012 Orientation and 21st Century Leadership Symposium Evaluation Report.” The update is also supported by MUST scholar records at the Hispanic College Fund.

PROJECT DESCRIPTION

The NASA Motivating Undergraduates in Science and Technology (MUST) Project is managed by NASA John H. Glenn Research Center at Lewis Field and administered by the Hispanic College Fund (HCF). MUST is a multi-year initiative to develop undergraduate skill sets and expertise critical to the future Science, Technology, Engineering, and Math (STEM) workforce and mission of NASA. It is the only undergraduate scholarship program at NASA that is dedicated to underserved and underrepresented students and is renewable through college graduation.

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| Number of students served: | 108 |
| Age group: | Undergraduates |
| Project focus: | All groups underserved in STEM |

RESEARCH-BASED PROJECT MODEL

MUST offers proven and intensive interventions for underrepresented and underserved students in STEM. The National Academies report *Expanding Underrepresented Minority Participation: America’s Science and Technology Talent at the Crossroads* (2010) found that successful college retention and workforce entry programs include research experiences, professional development activities, mentoring, academic support and social integration. *Expanding Underrepresented Minority Participation* also offers three additional recommendations for a successful national effort to increase the participation and success of underrepresented minorities in STEM; they include *access and motivation, affordability,* and *academic and social support.*

Access and Motivation

Individualized Student Support: A dedicated team of two HCF staff members works on a personal level with each MUST Scholar to support them through college. They provide individual monthly follow up and a monthly newsletter highlighting scholar achievements,

opportunities in NASA education, in addition to professional development opportunities with STEM associations and conferences around the nation.

NASA Internship Experience: MUST Scholars participate in a 10-week internship at one of NASA's ten nationwide centers. Scholars are matched with a mentor, receive an internship stipend of \$6,000, and participate in the MUST Annual Challenge.

Affordability

Scholarships: Project participants receive a scholarship of up to half of tuition and fees, not to exceed \$10,000 per year. The scholarship is renewable through to college graduation provided that all eligibility criteria continues to be met.

Academic and Social Support

MUST Orientation and 21st Century Leadership Symposium: The MUST Orientation and 21st Century Leadership Symposium offers scholars a project orientation and professional development workshops; MUST Scholars also have the opportunity to present their research, share experiences with their peers, and meet with NASA Center representatives to learn about internship opportunities. The MUST Orientation and Leadership Symposium is designed to meet four goals:

- 1) Students leave the event inspired to excel academically and have a plan to develop a broad skill set while an undergraduate student.
- 2) Students have an enhanced support network of MUST staff and fellow scholars who will support them throughout the year.
- 3) Students learn new skills and confidence, preparing them for life after college.
- 4) Students acquire knowledge about opportunities to pursue graduate school, employment at NASA and within the STEM industry.

Mentorship and Tutoring: Scholars receive tutoring support as requested. Students are only required to secure tutoring if their GPA falls below a 3.0. In this case, they are given one semester of tutoring to increase their GPA to the minimum 3.0 level necessary for MUST renewal.

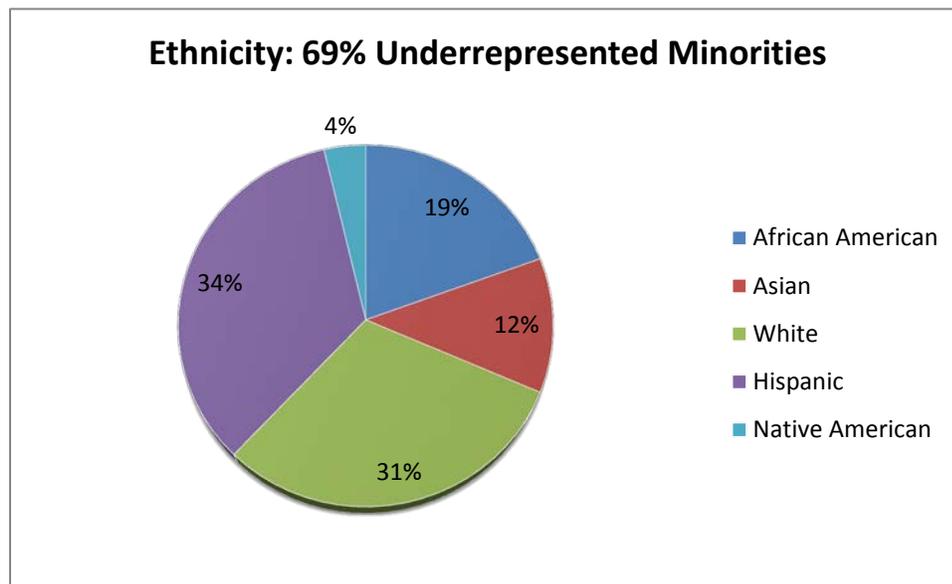
The MUST mentorship program strives to: Assist scholars in academic development, prepare scholars to be competitive candidates in the workplace, create an extended support network, and provide insight on graduate school. All scholars have the option of being placed with as many as three mentors: faculty, graduate, and peer. First year participants must select at least one mentor, and may decide whether a faculty, graduate, or peer mentor is most appropriate to their needs.

MUST SCHOLAR DEMOGRAPHICS FOR 2011-2012

- Ninety-four percent of eligible scholars renewed from the 2010-11 academic year. Those not renewing chose to pursue an internship in the private sector.

- By class year, 43.5 percent of MUST participants were juniors, 35.2 percent seniors, and 21.3 percent sophomores.
- Females comprised 50 percent of the new MUST cohort.
- Ten percent of students participating in MUST in the fall of 2011 were majoring in fields related specifically to space, such as Aerospace and Astrophysics. Another 50 percent were studying Engineering not tied explicitly to space and an additional 40 percent were pursuing a Science, Mathematics or Technology major.
- Sixty-one percent of participants had GPAs between 3.5 and 4.0. Only 39 percent of students had a grade point average below 3.5. The median GPA was 3.63.
- Twenty-seven percent of students were the first in their family to attend college
- Nineteen percent of students attended a minority-serving institution
- MUST saw a dramatic increase in geographic diversity and currently serves students from 32 states and Puerto Rico, up from 23 states in 2010. The greatest number of MUST participants in the fall of 2011 came from Texas, California, New York, Florida and Maryland.
- Seven MUST scholars reported having a disability.

Table 1 - Ethnicity: 69% Underrepresented Minority



PROJECT GOALS

Goal One: Support the development of STEM expertise leading to eventual degrees among groups that are currently underrepresented in the workforce, including women, minorities, persons with disabilities, and individuals from rural and low-income communities.

Goal Two: Provide support services such as mentoring to ensure that students successfully complete their coursework and encourage degree completion.

Goal Three: Provide hands-on research experiences that broaden interests in the aerospace industry.

Goal Four: Prepare students for a career in STEM by engaging them in holistic professional development experiences.

PROJECT BENEFIT TO STRATEGIC GOAL 6

The MUST project directly supports Strategic Goal 6 of the NASA Education portfolio by contributing to the accomplishment of the following PAR metrics:

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.

Objective 6.1.2: Provide NASA experiences that inspire student interest and achievement in STEM disciplines.

Outcome 6.4: Inform, engage and inspire the public by sharing NASA's missions, challenges, and results.

Objective 6.4.1: Use strategic partnerships with formal and informal educational organizations to provide NASA content to promote interest in STEM.

PROJECT ACCOMPLISHMENTS FOR 2011-2012

Project Performance for Goal One:

Scholarships:

- MUST scholars were awarded \$744,879.53 in scholarships.

Scholar Profiles:

- MUST served a diverse group of students in 2011–12 (69 percent minority, 27 percent first generation, representing 71 universities, across 32 states and Puerto Rico).
- In the 2011-2012 MUST Scholars cohort 69 percent of are underserved and underrepresented minority, 50 percent female, and 6.5 percent disabled students.

- Sixty percent were majoring in engineering, 40 percent in science or math, and 10 percent in a space related major (aerospace, astrophysics, and astronomy).

Academic and Professional Interests:

- Based upon self-reported data collected from the student surveys, every MUST Scholar enrolled in at least one STEM class both semesters.
- Seventy-nine percent of MUST students took at least one natural science or math course (e.g., Chemistry, Physics), and more than half were in an engineering class.
- Scholars were most likely to report that they encountered new concepts (over 98 percent in both semesters), increased their knowledge (over 95 percent in both semesters), and increased their interest in their field of study (92 percent and 90 percent in fall and spring, respectively).
- In their end of semester surveys, about 90 percent of students reported that they had been challenged academically during the previous term. Students also reported that they encountered a new discipline (88 and 85 percent) or new paths to a career (75 percent in the fall and 65 percent in the spring).

Project Performance for Goal Two:

Mentorship:

- Almost all of the mentees (98 percent) did contact their mentors.
- A smaller percent of scholars contacted their mentor by October 1st (58 percent). Faculty and graduate mentors were more likely to spend more time with their mentors, while peer mentors were most likely to spend 0-2 hours per month mentoring.
- Faculty mentors were likely to contact their scholars face-to-face or through email, while graduate and peer mentors used email almost exclusively.
- Contact dropped off slightly between the fall and spring semesters for graduate students and peer mentors but remained similar for faculty mentors.
- Focusing on the spring semester, the most commonly discussed topics by mentors with scholars were graduate school, STEM-related research and professional opportunities, career issues, senior year/life after MUST, STEM-related professional organizations, and how to excel academically. The least common topic was financial aid, with about one third of all mentees discussing time management, balancing academics and a social life, and STEM-related professional organizations with their mentors.
- Faculty were more likely to talk to scholars about a greater number of topics. For five of the eight topics, a greater or equal percentage of faculty mentors than graduate student or peer mentors discussed it with their scholar. Graduate mentors were the most likely of any mentor group to discuss senior year/life after MUST and financial aid with their mentee. Peer mentors were most likely to discuss balancing academics with a social life with their mentee.
- Over half of all mentors (69 percent) thought that the number of interactions was frequent enough, and the vast majority rated the quality of the interaction with the scholars as satisfying (79 percent).

- Mentors were asked to rate their scholars' abilities (e.g., communication, initiative) and effort. Mentors' overall ratings were consistently high and very similar across skills, ranging from 77 percent to 89 percent. There were few differences by type of mentor.

Project Performance for Goal Three:

NASA Internship Experience:

- Eighty scholars were involved in internships during the summer of 2011, 74 percent in a NASA sponsored experience.
- Students involved in NASA-sponsored research highlighted the value of the professional connections they made, the enhancement of their STEM content knowledge, and their access to conferences and other professional events and organizations.
- The majority of scholars (82 percent) reported that their NASA-related internship helped them clarify their career plans.
- The majority of scholars (84 percent) reported that their NASA-related internship had a positive impact on their current course of study.
- Scholars felt that their NASA related internship helped them to better understand their capabilities in technology (74 percent), engineering (69 percent), science (75 percent), and to a lesser extent, math (53 percent).

Project Performance for Goal Four:

Professional Development Activities:

- Ninety-one percent of MUST Scholars attended professional conferences in the fall semester and fifty-six percent attended during the spring.
- Interview training, attending professional conferences and career fairs, and cultural competence training were the top three types of professional development experienced across the year.
- MUST scholars attributed accomplishments in the fields of leadership and outreach, academic focus and grades, and research experiences to their involvement with MUST.
- All scholars engaged in a NASA related internship presented their research publically.
- Fifty-six percent of MUST scholars presented at a conference during the fall semester while twenty-four percent presented during the spring semester.
- 10 MUST scholars received a Travel Award to attend a professional conference.
- About 60 percent of scholars reported engaging in outreach activities in the spring semester. The majority of these activities were mentoring or tutoring younger students in STEM fields.

MUST Orientation and 21st Century Leadership Symposium:

- Over 70 percent of scholars *agreed* or *strongly agreed* that the MUST Symposium inspired them both to excel academically and to plan to develop their skill sets.

- In addition over 80 percent *strongly agreed* or *agreed* that five of the seven workshops were inspirational and useful. Further, over 90 percent of scholars *agreed* or *strongly agreed* that all four speakers were interesting
- Eighty-four percent of scholars *agreed* or *strongly agreed* that the MUST Symposium enhanced their support network for the year.
- Sixty-seven percent of scholars *agreed* or *strongly agreed* that the goal of having new knowledge to pursue graduate school was met
- Just over half of the scholars *agreed* or *strongly agreed* that the goal of having new knowledge about NASA was met. Of course, all scholars have attended previous Symposiums and had NASA internships, so one would expect this figure to be lower.
- Eighty percent of scholars *agreed* or *strongly agreed* that the goal of having new knowledge about employment opportunities within STEM fields was met.

PROJECT CONTRIBUTIONS TO STRATEGIC GOAL 6

Project Contribution to Outcome 6.1: The MUST Project supported this outcome by providing 108 students with scholarships, matching scholars with appropriate peer, graduate, and faculty mentors, and providing professional development opportunities during the Orientation and Leadership Symposium as well as through the MUST Newsletter. The result was a 94% renewal rate, 25 STEM college graduates, and 11 MUST scholars selected as NASA Ambassadors.

Project Contribution to Objective 6.1.2: Seventy-four percent of MUST scholars were involved in a NASA internship during the summer of 2011. The NASA experience helped to make STEM courses more relevant for scholars, increased their overall STEM capabilities, and supported them in developing a career plan.

Project Contribution to Outcome 6.4: MUST scholars participating in a NASA internship shared their experience with STEM professionals, college students, and the k-12 community across the nation via professional conferences and outreach events.

Project Contribution to Objective 6.4.1: MUST scholars informed and engaged numerous individuals within the k-12 and university community. Eighty-one percent of MUST scholars engaged in mentoring during the academic year and 73.5 percent of scholars reported engaging in outreach activities specifically targeting the K-12 community.; the majority of these activities were mentoring or tutoring younger students in STEM fields.

IMPROVEMENTS IN THE PAST YEAR

The MUST Project continuously strives to provide students with a stronger support system and to demonstrate its outcomes to stakeholders. As a result, HCF formed a partnership with MPR and Associates. MPR's work combines deep content expertise, a thorough understanding of data and analysis and innovative techniques for making data and

research accessible to many audiences. Their work focuses on college and career preparation; postsecondary education, including community colleges; and adult education.

While last year we focused on identifying various reports and student resources that would enhance the NASA MUST Program. In 2011, we focused on refining and updating these resources:

Resource Manual: Study Abroad Programs in STEM: MUST students show interest in studying abroad but have difficulty finding programs that meet MUST requirements. The increasingly global economy that we live in encourages their interest.

This guide facilitates student success in selecting a study abroad program that builds both 21st century skill sets and STEM expertise. It includes information on study abroad programs that meet all the NASA MUST criteria as well as the pros and cons of studying abroad. Descriptions of the programs available include the necessary details to allow students to explore programs with different characteristics and make an informed choice.

Resource Manual: MUST Presentation Opportunities: A desired outcome of this resource manual is to increase the number of applications for the MUST travel award. The 2009-10 evaluation report found that although about two-thirds of MUST students conduct NASA research only 19% presented their work at a professional or academic conference in the fall, and 15% did so in the spring. The 2009-10 evaluation report also reported finding that students who were Hispanic, attended MSIs, or were the first-in their family to go to college were more likely to present than their counterparts. It's therefore particularly important that students who are not part of these groups are made aware of opportunities to present.

This guide lists professional and academic conferences focused on STEM where MUST scholars can improve their oral presentation skills and share their NASA experience with a larger community. It lists conferences by field of study and region and includes a range in the type and size of conferences so that students can choose a conference that will allow them to demonstrate their particular expertise or interest in a comfortable venue.

Alumni Survey and Report: MUST graduates will be consistently and systematically tracked to promote results to stakeholders. Alumni will receive the survey for the first time when they graduate from college. Students will then receive the survey yearly for four more years. This survey will collect information to determine how MUST participation affects the decisions that students make for graduate school and their career. The group studied in the first report will include all MUST alumni from 2009-2011.

MUST Orientation and Leadership Symposium: The NASA MUST Orientation and Leadership Symposium has supported MUST Scholar development and retention since its inception in 2008. Each year the symposium works to motivate scholars for the academic year, prepare them with skills for the workforce, and create a support system of resources

and encouragement to keep them strong in their pursuit of a STEM degree. The impact and improvements to the Symposium are demonstrated in student GPAs and renewal rates. In 2008, 18 scholars received GPA Waivers with 11 earning renewal eligibility; that number fell to 6 in 2011 with all scholars earning renewal eligibility. In addition, the MUST Orientation and Leadership Symposium has helped staff to form stronger relationships with students thereby allowing us to better support them during the academic year. Scholar renewal rates have increased sharply from 77% in 2008 to 94% in 2011.

MUST Newsletter and Facebook: MUST began publishing a newsletter that offers valuable information to students on how to develop their skills and take advantage of all the opportunities available to them through the NASA MUST Project. The newsletter includes dates of important events, NASA information and opportunities, helpful links, scholar highlights, professional development materials, and more.

The MUST Facebook page has 188 members including current scholars, project alumni, and MUST Project staff. The page shares information with its members on employment at NASA, education and professional development opportunities at NASA, STEM news articles, and highlights MUST scholar accomplishments.

MUST Scholar Website: Scholars in the MUST Project have shown consistent dedication to other underserved and underrepresented students in need of encouragement and opportunity. They work to inspire the next generation in STEM by using their background and NASA experience to reach youth in a unique and impactful way. MUST scholars serve as tutors, mentors and organize outreach activities that undoubtedly make a difference for young people around the country. With support from HCF, scholars are developing a MUST Outreach Website that will allow them to record their activities and share their successes with the greater MUST community.

The NASA MUST Project also launched the project's official website. The website serves as an outreach tool for prospective applicants, but also as an information center for current MUST Scholars. It highlights MUST Scholars' achievements, provides information about career and professional development opportunities and facilitates collaboration between scholars.

MUST Scholars Showcasing their NASA Experience as Panelists: Several MUST scholars participated in NASA Awareness Workshops on behalf of the One Stop Shopping Initiative to share their first hand experience in NASA MUST and its role in their professional development. Scholars gave recommendations to prepare and apply for a NASA opportunity. Participating MUST Scholars included: Michael Barnes , Liz Marie Comenencia Ortiz, Jaseft Canales-Oppenheimer, Christopher Halcon, and Denice Calderon.

PROJECT PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

The NASA MUST Project invited the NASA Harriett G. Jenkins Fellows to participate in the 2011 NASA MUST 21st Century Leadership Symposium. This collaboration gave MUST Scholars the opportunity to expand their networks, and gain insights into STEM graduate programs.