

Report Brief:

NASA STEM Engagement Internships Outcome Assessment Evaluation - Year One

September 2022

In order to inspire more young people to pursue STEM careers, NASA has made considerable investments in various NASA internship programs. These programs provide real-world, authentic, learning experiences for students in high school through graduate school. Through these programs, NASA aims to provide opportunities for diverse students to engage with NASA experts, contribute to NASA's work, and, ultimately to transition into the NASA workforce (see Figure 1 for an overview of NASA's goals for its STEM Engagement programs).

The NASA Office of STEM Engagement (OSTEM) Internship Program is one of the NASA internship programs. The OSTEM internships provides opportunities for high school and post-secondary students to participate in six- to ten-week internships each spring, summer, and fall for a minimum of 400 hours. To ensure that the OSTEM internship program meets the goals outlined in Figure 1, NASA's OSTEM engages in continuous performance assessment and evaluation of the internship program. Annual investigations are conducted that seek to understand the impact of NASA's OSTEM Internship Program on participants' knowledge, skills, interest, and readiness for the STEM workforce.

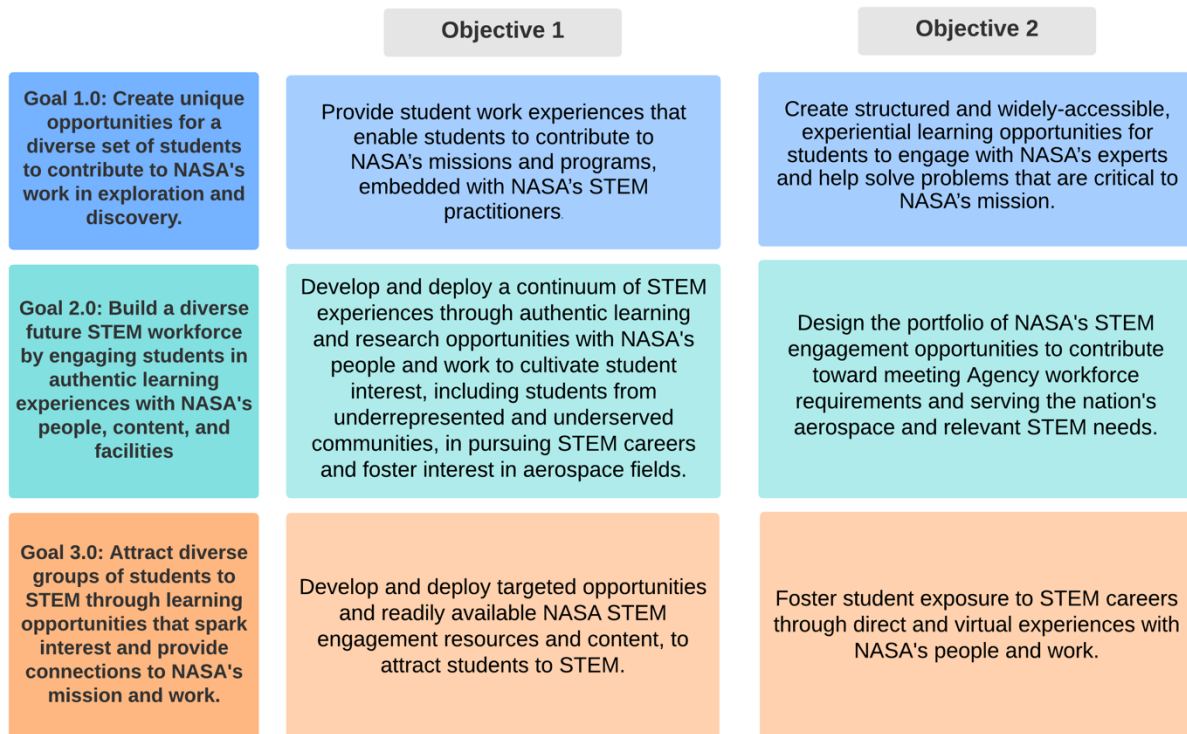


Figure 1. Goals and Objectives for NASA STEM Engagement

Purpose of the Report Brief

This brief includes an overview of the 2021-22 outcome assessment of NASA's OSTEM Internship Program.

The purpose of the annual assessment was to:

1. measure the impact of participation in NASA internships;
2. investigate how interns are contributing to NASA's missions; and
3. consider how to broaden the participation of students from groups historically underrepresented and underserved in STEM fields.

WHO PARTICIPATED IN STUDY?

NASA OSTEM Engagement Internship Program

NASA OSTEM interns are paired with NASA career professionals to participate in mentor-directed tasks that allow interns to contribute to the NASA's operations, missions, and programs.

NASA OSTEM interns engage in at least 400 contact hours of degree-related work. Internships can be full- or part-time and can be conducted at NASA facilities or anywhere that activities related to NASA missions are taking place. NASA OSTEM internship mentors can be civil servants, contractors, or academic professionals doing work directly related to NASA's ongoing missions. Internships are differentiated from other experiential educational activities in that students work one-on-one with mentors and focus on contributing to NASA workplace tasks.

Evaluation Study Participants

The 2021-22 study included three cohorts of interns. A total of 2,344 interns participated in NASA internships during the 2021 calendar year (time of study): 465 in Spring; 1,331 in Summer; and 548 in Fall. This pool of NASA interns was used as the sample for this study. Additionally, 1,299 mentors worked with interns during the time of the study: 291 in Spring; 673 in Summer; and 335 in Fall. See Table 2 for a breakdown of intern survey respondents.

Table 1. Intern Survey Respondent Profile Spring, Summer, & Fall 2021 (n=1,167)

Demographic Category	Survey Respondents	
Internship Cohort		
Spring 2021	193	17%
Summer 2021	789	67%
Fall 2021	185	16%
Experience Format		
In-person	9	<1%
Hybrid	50	4%
Virtual	1,107	95%
Do not wish to provide	1	<1%
Gender		

Female	545	47%
Male	576	49%
Do not wish to provide	46	4%
Ethnicity		
Hispanic or Latino	166	14%
Not Hispanic or Latino	943	81%
Do not wish to provide	58	5%
Race		
American Indian or Alaskan Native	18	1%
Asian	159	14%
Black or African American	105	9%
Native Hawaiian or Other Pacific Islander	1	<1%
White	678	58%
More than one	58	5%
Do not wish to provide	148	13%
Disability		
Yes	66	6%
No	1,040	89%
Do not wish to provide	61	6%
English 1st Language		
Yes	1,012	87%
No	134	11%
Do not wish to provide	21	2%
Parent Graduated from College		
Yes	921	79%
No	222	19%
Do not wish to provide	24	2%
Grade Level		
High School Freshman	1	<1%
High School Sophomore	2	<1%
High School Junior	15	1%
High School Senior	32	3%
College Freshman	31	3%
College Sophomore	105	9%
College Junior	230	20%
College Senior	364	31%
Graduate Program	332	28%
Other [†]	44	4%
Do not wish to provide	11	<1%
Pell Grant Eligible		
Yes	383	33%
No	681	58%

Not Applicable (I am not a college student)	41	4%
Do not wish to provide	62	5%
Free/Reduced Lunch Eligible in High School		
Yes	265	23%
No	815	70%
Other ⁺⁺	26	2%
Do not wish to provide	61	5%
High School Location		
Urban	216	19%
Rural	171	15%
Suburban	728	62%
Do not wish to provide	52	4%
Underserved/Underrepresented Status (U2)		
Yes – U2	592	51%
No – Not U2	405	35%
Insufficient Data ⁺⁺⁺	170	14%

Interns who had at least two demographic characteristics that are underrepresented in STEM fields were classified as “U2.” For example, a woman who qualified for free/reduced lunch in high school would be underrepresented in STEM by both gender and socio-economic status. About half (51%) of interns qualified as U2 participants.

HOW WAS STUDY CONDUCTED?

Details of the 2021-22 Evaluation

The 2021-22 OSTEM Internship Program evaluation was guided by the following evaluation questions:

1. To what extent is participation in NASA internships associated with a) intern satisfaction with the program? b) interns’ self-reported gains in science and research-related outcomes? c) interns’ likelihood to pursue future STEM-related activities, education, and careers?
2. Are there any differences in interns’ reports based on underrepresented group status?
3. What insight do mentors provide on the intern program?
4. How do mentors characterize interns’ contributions to NASA’s missions?
5. Do interns demonstrate growth toward mastery of 21st century skills (See Figure 2) across the duration of the internship as assessed by their mentors?

The OSTEM Internship Program evaluation study used a utilization-focused evaluation approach (Patton, 2015), an approach that emphasizes the use and application of evaluation findings. The goals of the outcome evaluation were to understand the impact of the internship experience on interns’ knowledge, attitude(s), and/or behavior(s) resulting from participation in the program; to understand how interns are contributing to NASA’s missions; and to gain insight on how to broaden the participation of students from groups historically underrepresented and underserved in STEM fields.

Data were collected the spring, summer, and fall of 2021 and included participant surveys/questionnaires for both interns and mentors and the 21st Century Skills Assessment. Survey data were collected at the end of each intern cycle to provide a snapshot of the behaviors, attitudes, and beliefs of internship participants and mentors. The 21st Century Skills Assessment is used to measure interns' progress toward mastery of important 21st Century Skills (Sondergeld & Johnson, 2019); mentors completed the assessment for each intern at the beginning and again at the end of the internships.

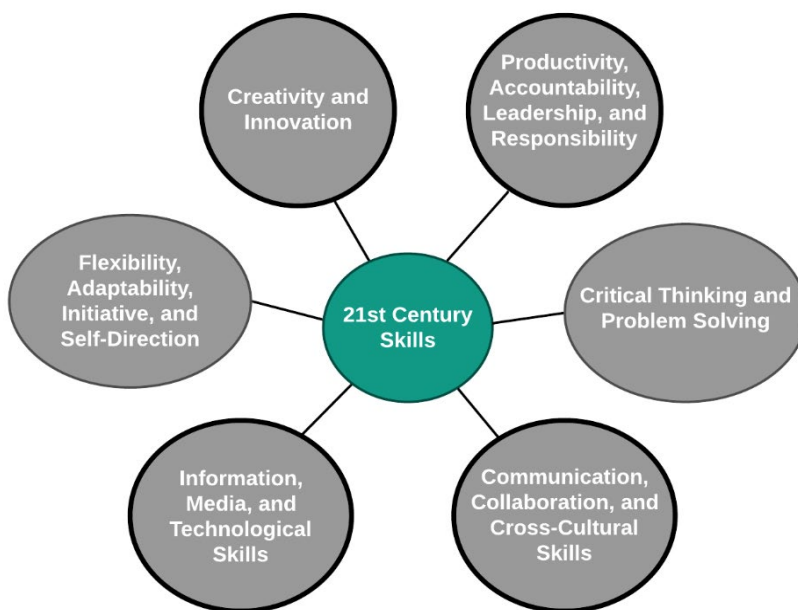


Figure 2. 21st Century Skills Assessment Categories

These assessments were used to determine intern growth toward mastery of 21st Century Skills over the course of the internship. Table 1 provides a timeline for data collection for each of the three internship cycles.

Table 2. Data Collection Procedures

Evaluation Question	Task or Milestone	Timeframe Dates
To what extent is participation in NASA Internships associated with: a) intern satisfaction with the program? b) interns' self-reported gains in science and	Distribute Intern Survey	Spring Cycle – May 2021 Summer Cycle – July 2021 Fall Cycle – October 2021

<p>research-related outcomes? and c) interns' likelihood to pursue future STEM-related activities, education, and careers?</p> <p>Are there any differences in interns' reports based upon underrepresented group status?</p>	Analyze Intern Survey	<p>Spring Cycle - June 2021</p> <p>Summer Cycle – August 2021</p> <p>Fall Cycle – November 2021</p>
<p>What insight do mentors provide on the intern program?</p>	Distribute Mentor Survey	<p>Spring Cycle – May 2021</p> <p>Summer Cycle – July 2021</p> <p>Fall Cycle – October 2021</p>
<p>How do mentors characterize interns' contributions to NASA's missions?</p>	Analyze Mentor Survey	<p>Spring Cycle - June 2021</p> <p>Summer Cycle – August 2021</p> <p>Fall Cycle – November 2021</p>
<p>Do interns demonstrate growth toward mastery of 21st century skills across the duration of the internship as assessed by their mentors?</p>	21 st Century Skills Pre-Assessment	Fall Cycle – August/September 2021
	21 st Century Skills Post-Assessment	Fall Cycle – November/December 2021

Data Analysis

This study used quantitative and qualitative methods to analyze data. Quantitative data were summarized using descriptive statistics. Qualitative data were manually coded to identify themes and commonalities in participants' survey responses.

WHAT DID WE FIND OUT?

Summary of Findings

Findings from the NASA OSTEM internship study suggested that NASA is providing a high-quality internship experience for participants. The OSTEM internship programs also seem to be broadening the participation of underrepresented and underserved individuals in internships and pursuing future opportunities in STEM. The following are key findings from the study:

1. Interns were extremely satisfied with the internship program.
2. There was a strong relationship between participation in the internship program and gains in interns' science and research skills and engagement.
3. Most interns participating in the evaluation reported interest in future STEM-related activities, education, and careers.
4. All participants in the evaluation study demonstrated growth in 21st century skills.

5. U2-identified participants experienced greater gains in STEM knowledge, STEM competencies, STEM identity, 21st century skills, future STEM interest, and overall impact of the internship program.
6. Mentors reported satisfaction with the internship program and positive attitudes about their interns' contributions to NASA missions and had used effective mentoring practices in their mentorship.

WHAT CAN THE PROGRAM DO TO IMPROVE?

Conclusions from Study

Evaluation findings indicated that NASA's interns and mentors were overall very satisfied with their experiences in the internship program, however participants also noted some areas with potential for improvement. Interns and mentors suggested that the NASA OSTEM Internship Program could:

1. Explore the possibility of expanding the use of virtual internships to be more inclusive of U2 students.
2. Provide resources to mentors on how to make virtual/hybrid internships more interactive and engaging.
3. Explore how to promote NASA STEM careers more effectively via social media.
4. Develop trainings and resources for interns for the onboarding process and for technology
5. Develop trainings and resources for mentors to assist them with establishing clear goals and objectives for their interns.
6. Identify key mentoring practices and provide training on mentoring best practices for mentors, including culturally responsive mentoring.
7. Increase focus on growing interns' STEM engagement, STEM competencies, and 21st century skills.
8. Increase interns' future involvement in other NASA programs by highlight other NASA pipeline programs, including the skills needed for participation and application processes.
9. Create opportunities for interns to investigate and grow their STEM identities so that they can see themselves as future NASA scientists and engineers.
10. Learn more about mentors' demographics, experiences, current positions, and reasons for wanting to be a mentor.
11. Explore and unpack the "culture of NASA" to understand how this culture could be more supportive and inclusive of diverse interns.

WHAT ARE THE KEY TAKEAWAYS?

NASA's OSTEM Internship Program engages interns from diverse backgrounds in meaningful collaboration with mentors to contribute to NASA's missions.

Through their participation in the program, interns—especially those from underrepresented and underserved STEM populations—make gains in the following areas: STEM knowledge; STEM competencies; STEM identity; 21st century skills; and interest in future STEM activities, education, and careers.

NASA can continue to broaden and grow participation in its OSTEM Internship programs by doing the following:

- Engaging in more effective social media marketing
- Providing more opportunities for virtual/hybrid participation in internships
- Supporting interns' development of STEM identity
- Providing more support to both interns and mentors in developing mentoring relationships.

REFERENCES

Sondergeld, T.A. & Johnson, C.C. (2019). The development and validation of a 21st century skills assessment: Using an iterative multimethod approach. *School Science and Mathematics*, 119(6), 312-326.