Mission2Mars:
Boosting Community Engagement with NASA Resources

Year 2 Evaluation Report

April 2024

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Introduction

In preparation for the final year of the Mission2Mars: Boosting Community Engagement with NASA Resources program (Mission2Mars), Education Development Center (EDC) collected and analyzed formative evaluation data from Year 2 of the program. This report is based on five data sources which include: 1) Cohort 2 informal science institutions staff training post-survey, 2) Interviews with amateur astronomers, 3) Community-based organization staff annual survey, 4) Informal science institution staff annual survey, and 5) Event satisfaction survey. The goal of the report is to document insights from program implementation to date and inform decision-making and refinements for the final year of the program.

Report Organization

In this report, we first provide an overview of the program model and the evaluation data collection activities in Year 2. Second, we document key takeaways from the data regarding five areas: trainings for community-based organization staff and amateur astronomers, Mission2Mars events, outcomes for informal science institution staff, community-based organization staff, and children and family event participants, partnerships between informal science institution staff, community-based organization staff, and amateur astronomers, and the role of the amateur astronomer. Finally, we highlight considerations and next steps.

Program Model

Mission2Mars operates on a train-the-trainer model. This means The Franklin Institute staff train other informal science institutions to (1) disseminate the Mission2Mars program with their community-based organizations (e.g., act as the main point of contact for questions and support) and (2) train community-based organizations and amateur astronomers to host events and implement Mission2Mars activities. Informal science institutions subsequently train community-based organizations to host events and facilitate Mission2Mars activities, and train amateur astronomers to support community-based organizations with their events. In Year 2, the Mission2Mars project team onboarded five new Cohort 2 informal science institutions from five different states: Alaska, Maine, North Dakota, Oregon, and Texas. These institutions in turn partnered with 44 community-based organizations (Table 1). The five informal science institutions from Year 1 continued to lead programming in Year 2.

Table 1. Number of informal science institutions and community-based organizations in Year 1 and Year 2.[1]

Group	Year 1	Year 2	Total
Informal Science Institutions	5	5	10
Community-Based Organizations	26	44	70

In Year 2, Mission2Mars activities focused on Mars-related space content for Cohort 1, and moon-related content for Cohort 2. Both cohorts received training for activities focused on solar-related content. The Franklin Institute provided informal science institutions and

[1] At the time this report was written, there were five informal science institutions in Cohort 2. However, as of March 2024, there are four Cohort 2 informal science institutions participating in the program.

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community-based organizations with a variety of activities they can use during their events. Amateur astronomers attended events to share equipment like telescopes and their knowledge of astronomy with participants. Community-based organization staff and amateur astronomers were encouraged to talk about the Artemis program during events with participants. To support program dissemination, The Franklin Institute held meetings to share updates, information, and to provide an opportunity for informal science institutions to share about their experiences in the program (e.g., recruiting amateur astronomers and community-based organizations).

Evaluation Overview

EDC conducts the Mission2Mars external evaluation. As part of the program's second year, we worked closely with The Franklin Institute to refine the evaluation plan for Year 2 in which we used a mixed methods approach to collect data about The Franklin Institute's areas of interest. Staff from Cohort 1 and 2 informal science institutions, community-based organization staff, amateur astronomers, and event participants participated in interviews and surveys (Table 2). Specifically:

- Informal science institution staff from Cohort 2 were invited to participate in a post-training survey, administered after the Mission2Mars Onboarding Webinar Series.
- All informal science institution and community-based organization staff were invited to participate in the annual surveys.
- A sample of amateur astronomers from Cohort 1 were invited to participate in interviews.
- Informal science institution staff from Cohort 2 were asked to coordinate with their community-based organizations to administer event surveys at up to five events.

Table 2. Year 2 data collection methods.

Method	Audience	Sample size (n)	Response rate
Training Survey (May 2023)	Informal science institution staff	9	69%
Interviews (October 2023)	Amateur astronomers	4	N/A
Annual Surveys (January 2024)	Informal science institution staff	14	56%
	Community-based organization staff	84	44%
Event Survey (March 2023 – January 2024)	Youth and family participants	190	N/A[2]

Limitations

The Year 2 evaluation has several limitations. These include:

- Ninety percent of event survey responses were collected at community-based organizations associated with one informal science institution. As such, they may not

[2] Surveys represent approximately twelve events across twelve community-based organizations and eight informal science institutions. Community-based organization staff were encouraged to administer the event survey at their events, one per family. As we do not know the number of families at these events, we cannot accurately calculate the response rate.

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be generalized to be representative of experiences with events across all informal science institutions.

- Annual survey data from community-based organization staff were collected from 84 out of 189 community-based organization staff (44%) and should not be generalized to be representative of all community-based organization staff.
- Annual survey data from informal science institutions were collected from 14 out of 25 informal science institution staff (56%) representing nine out of ten institutions and should not be generalized to be representative of all informal science institution staff.
- Interviews with amateur astronomers were done with a small sample of staff and may not represent the opinions of all amateur astronomers involved in the program.

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Key Takeaways

The following section describes seven key takeaways from the evaluation data collected in Year 2. While these findings provide insight for conversation and reflection, EDC will continue to explore these takeaways in the final year of the program.

1. Informal science institution staff consistently included space content in their trainings; yet they adapted trainings to meet the needs of community-based organization staff and amateur astronomers.

Over half (57%) of informal science institution staff survey respondents adapted trainings to better fit their community-based organization and amateur astronomer audiences. They did this in a variety of ways, including:

- Adding new content and incorporating new strategies (e.g., adding content to the PowerPoint deck, modelling activities).
- Adjusting content to meet the level of expertise of participants (e.g., gearing training towards those with experience facilitating events).
- Extending the length of the training (e.g., increasing the number of training sessions).

> "We trained a High School astronomy club in conjunction with their teacher advisor. So, we expanded the [amateur astronomer] training to include two 3-hour sessions…"
>
> *– Informal Science Institution Staff Survey Respondent*

> "We based the training on familiarity / expertise with running various events and programs."
>
> *– Informal Science Institution Staff Survey*

At the same time, informal science institution staff include key information in their trainings with both community-based organization staff and amateur astronomers. All respondents included the element "space content" in their trainings, 86% reported including "facilitating conversations" as an element in their training, and 57% reported including "attending events" as an element in their training (Figure 1). In terms of training attendees on specific content related to Mission2Mars activities, 79% of respondents reported training their audiences on basic astronomy content. Specifically, 100% of Cohort 1 respondents included Mars content in their training, and 100% of Cohort 2 respondents included Moon content in their training (Figure 2a and 2b). However, across Cohort 1 and Cohort 2, just 50% reported training staff on Artemis program content (Figure 2).

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Figure 1. All informal science institution staff survey respondents reported including "space content" as a section of information in their trainings, whereas only 57% reported including the section on "attending events" in their training.[3] (n = 14)

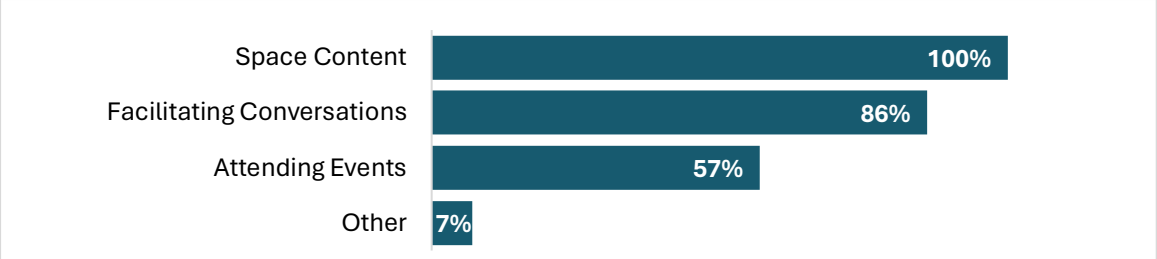


Figure 2. Seventy-nine percent of respondents included basic astronomy content in their trainings, whereas only 50% of respondents included Artemis content in their trainings. (n = 14)

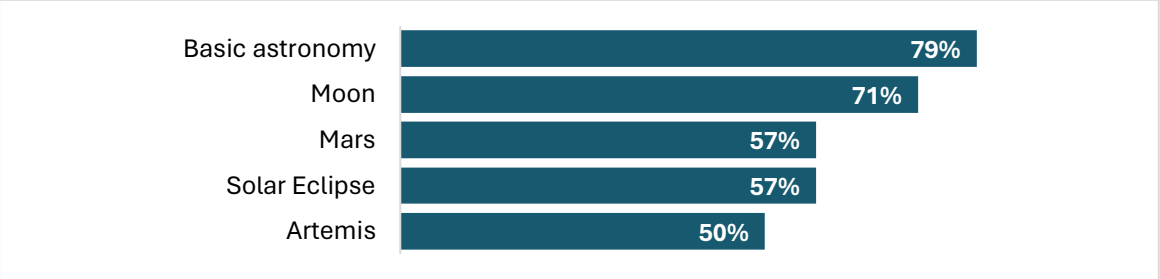


Figure 2a. Cohort 1 respondents all included Mars content in their trainings, and about one third included Moon content. (n=6)

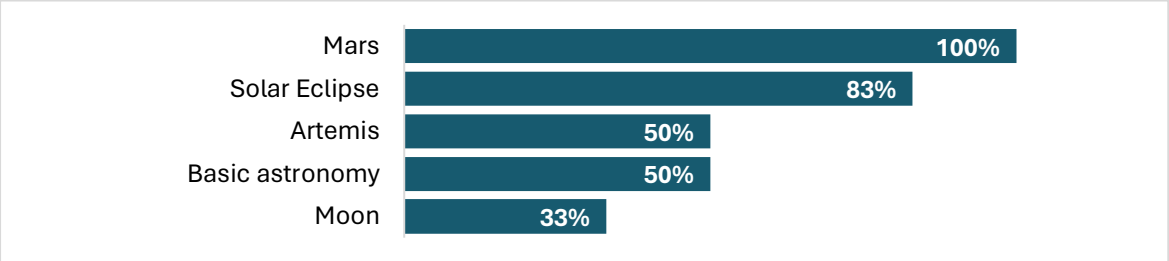
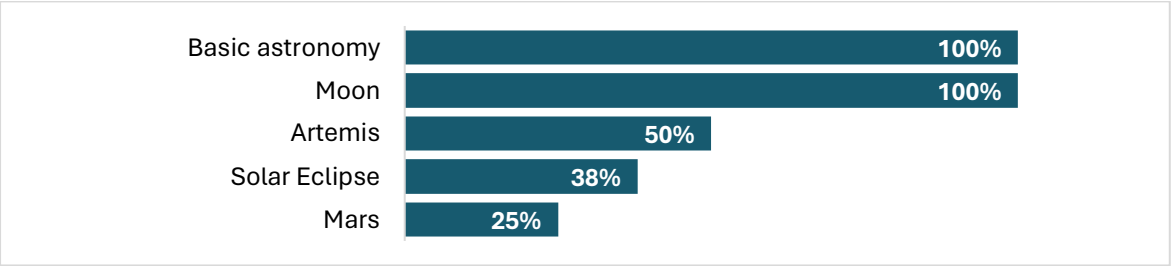


Figure 2b. Cohort 2 respondents all included basic astronomy and moon content in their trainings. (n=8)



[3] No informal science institution staff survey respondents who selected "Other" provided additional information.

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2. Community-based organization staff adapted Mission2Mars activities to meet the needs of their audiences, however, determining the best way to make changes to events was a central challenge.

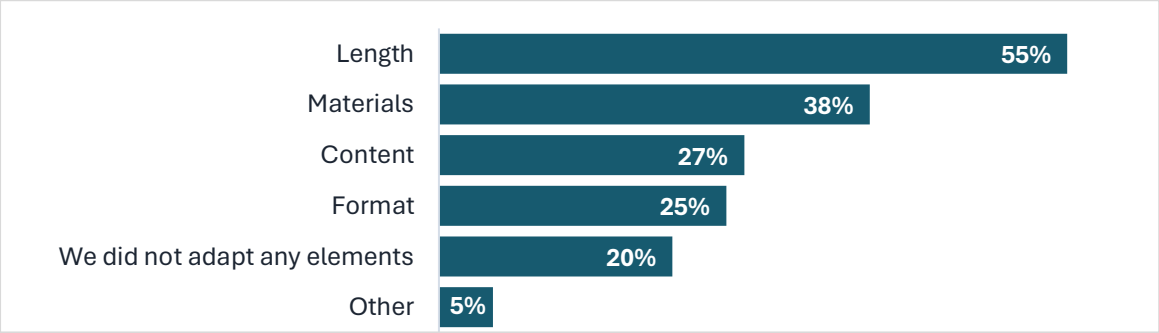
Eighty percent of community-based organization staff survey respondents reported adapting activities at events. These respondents adapted the activity length, materials used, content delivered, and format (Figure 3). Specifically, these respondents adapted Mission2Mars activities by breaking down activities into stations, simplifying the content presented in activities, and making the activities shorter. Respondents reported adding or modifying activity materials especially when they did not receive the necessary materials or when they received materials from their informal science institution that did not fit the activity. However, respondents noted that going through the process of adapting activities and determining the best way to do so was a key challenge.

> "Since we had to purchase our own materials, I adapted mine to use materials I was able to acquire."
>
> *– Community-Based Organization Staff Survey Respondent*

> "We know our audience and they tend to get restless when put in a program for too long. We also have a basic skeleton of how we do our programs, so we just fit the activities into the way that worked well for us."
>
> *– Community-Based Organization Staff Survey Respondent*

The activities that community-based organization staff most often implemented during Mission2Mars events included Solar Images, Impact Craters, Moon Phases, and Pocket Solar System. These activities were implemented the most because they were easy to implement across age ranges, centered a hands-on approach, and were easy to set up. Activities that were used the least included Sculpting Lunar Geology, Chalk Art, Observe the Sun, Safe Landing, Impact Craters, and Candy Core Samples.

Figure 3. Fifty-five percent of community-based organization staff survey respondents adapted the length of Mission2Mars activities (e.g., shortening or lengthening activity time) and 38% adapted materials.[4] (n = 64)



[4] Respondents selected multiple statements. As a result, percentages do not add to 100%. "Other" responses included "Adding extensions" and "Our activities just had a space, astronomy theme."

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3. As a result of participating in Mission2Mars, informal science institution staff have gained confidence in training staff and community-based organization staff have gained confidence in implementing events.

Informal science institution staff survey respondents reported high levels of confidence to train community-based organizations and amateur astronomers to coordinate and facilitate astronomy events now that they have participated in the program (Figure 4). In open ended responses, informal science institution staff survey respondents described that they gained new skills related to supporting staff to develop communication skills and ways to structure activities.

Cohort 1 and Cohort 2 community-based organization staff survey respondents were asked to reflect on their level of confidence implementing, facilitating, and planning Mission2Mars events. Overall, both cohorts report high levels of confidence across these areas. Specifically, Cohort 2 respondents feel most confident implementing astronomy activities (38%, "Very confident;" Figure 5) and Cohort 1 respondents feel most confident planning astronomy events (32%, "Very confident;" Figure 6). Additionally, community-based organization survey respondents from Cohort 1 and Cohort 2 gained new program content and activities, deepened their knowledge about space, and deepened their interest in astronomy.

> "I've supplemented some of the activities with additional elements that were an improvement on the original, learning more about activity design and engagement."
>
> *– Informal Science Institution Staff Survey Respondent*

> "I've enjoyed increasing my own knowledge about space and gaining the ability to competently / confidently share that knowledge with library patrons. It has been especially exciting to teach about the sun and solar eclipses given the October eclipse and the eclipse coming up in April. I'm glad we can be a source of reliable information and safe eclipse viewing glasses, thanks to this program."
>
> *– Community-Based Organization Staff Survey Respondent*

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Figure 4. Seventy-one percent of informal science institution staff survey respondents feel "Very confident" training community-based organization staff to coordinate and facilitate astronomy events. (n = 14)

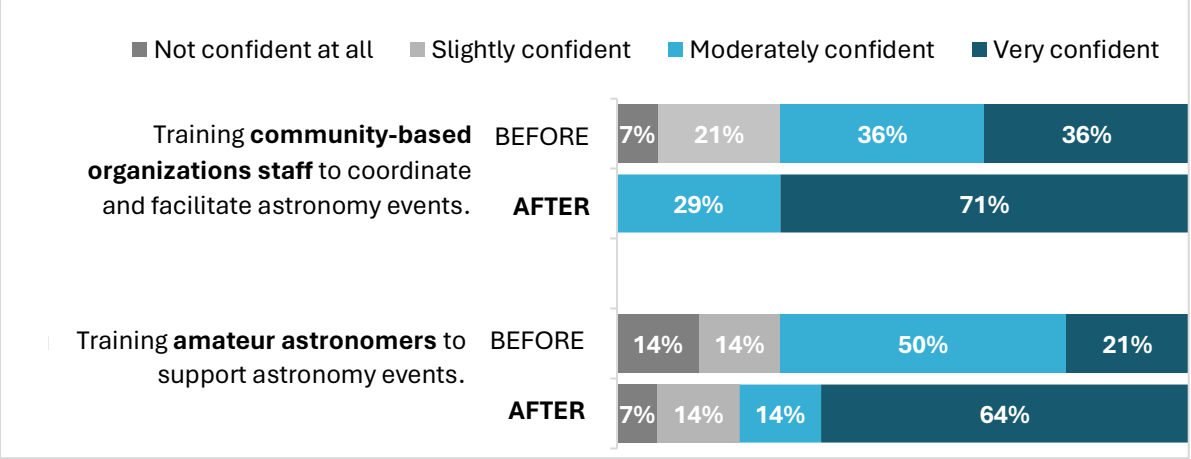


Figure 5. Overall, a majority of Cohort 2 community-based organization staff survey respondents report feeling "Moderately confident" or "Very confident" implementing, facilitating, and planning events.

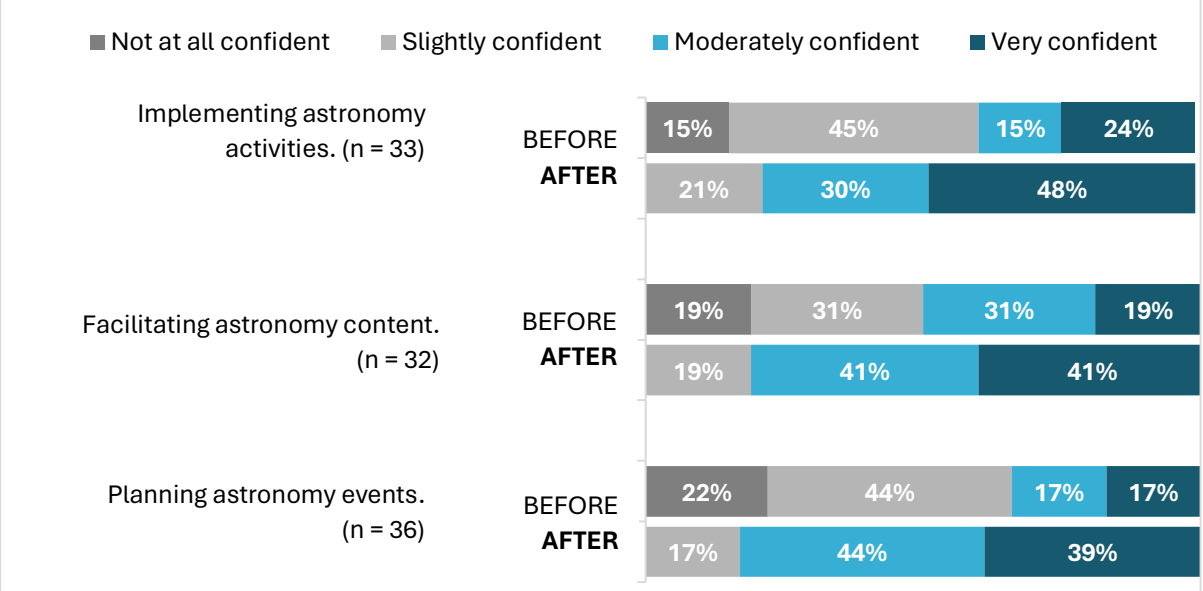
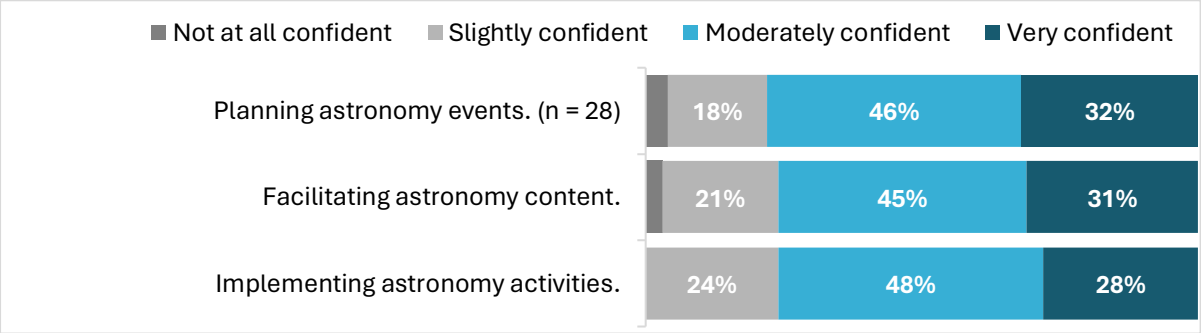


Figure 6. The majority of Cohort 1 community-based organization staff survey respondents feel "Moderately confident" or "Very confident" about planning events, facilitating content, and implementing activities. Unless otherwise noted, (n = 29).[5]



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4. Informal science institution and community-based organization staff have a positive working relationship; however, staff turnover at community-based organizations poses challenges to relationship-building.

All informal science institution staff survey respondents feel "Moderately effective" or "Very effective" developing or maintaining a relationship with community-based organizations (Figure 7). Similarly, 90% of community-based organization staff survey respondents "Agree" or "Strongly agree" they have a strong partnership with their informal science institution (Figure 8).

Nonetheless, informal science institution staff survey respondents reported that staff turnover at community-based organizations poses a challenge to deepening and sustaining relationships between these two groups. Informal science institution staff spend time training and supporting staff, and when these staff leave their positions, informal science institutions have to re-start lines of communication and the relationship building process.

> "Staff turnover at [community-based organizations] has been a problem - I get many of them trained only to have them leave the organization after several months, thus necessitating retraining."
>
> *– Informal Science Institution Staff Survev*

Figure 7. All informal science institution staff survey respondents report feeling "Moderately effective" or "Very effective" developing or maintaining a relationship with community-based organizations.[6] (n = 14)

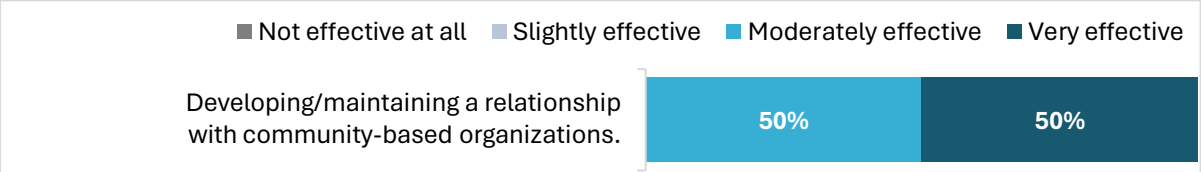
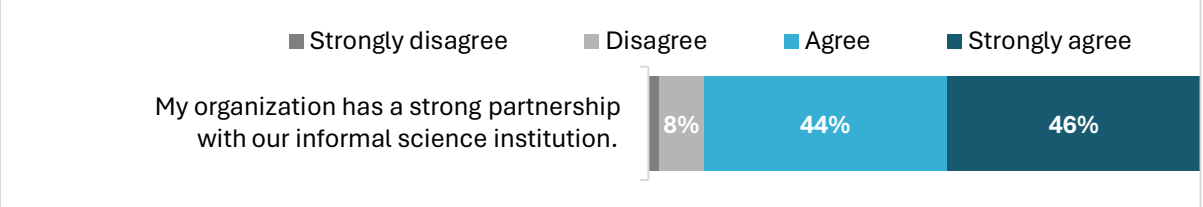


Figure 8. Ninety percent of community-based organization staff survey respondents "Agree" or "Strongly agree" that they have a strong partnership with their informal science institution.[7] (n = 61)



[6] No respondents selected "Not effective at all" or "Slightly effective." This figure combines responses from Cohort 1 and Cohort 2 informal science institution staff.
[7] Respondents who selected "Strongly disagree" represent 2% of respondents.

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5. Informal science institutions and community-based organizations are forming new partnerships through Mission2Mars and are optimistic about these partnerships going forward.

Informal science institution staff survey respondents reported working with between 4-22 community-based organizations with the majority working with between 4-7 each. Each informal science institution had 0-3 first time partnerships, and one informal science institution had 18 new partnerships.[8]

Informal science institution staff survey respondents are excited about the new relationships they formed, not only with community-based organizations, but also with amateur astronomers. For example, one informal science institution staff survey respondent shared that a key success for them was building relationships with amateur astronomers. Informal science institution staff survey respondents reflected on factors that contributed to strong relationships with community-based organizations, including:

> "We have gained key contacts not only with astronomers but also with other community organizations who we worked with in order to make our events possible. Our participation in the Mission2Mars program has really helped us tap into our community."
>
> *– Community-Based Organization Staff Survey Respondent*

- Having preexisting partnerships established with groups before Mission2Mars.
- Ensuring regular communication.
- Securing community-organization buy-in.

Community-based organization staff survey respondents also shared that a key takeaway from their involvement with Mission2Mars was that they developed new relationships or strengthened connections with their informal science institution, amateur astronomers, and other community organizations.

[8] Eight informal science institution respondents reported working with 4-7 community-based organizations. One informal science institution respondent reported working with 22 community-based organizations.

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6. There are ongoing barriers to including amateur astronomers in Mission2Mars events.

Overall, 78% of informal science institution staff survey respondents "Agree" or "Strongly agree" that amateur astronomers are important to the program. At the same time, nearly one quarter of these survey respondents "Disagree" that amateur astronomers play an important role in the program (Figure 9). Additionally, 57% of respondents reported that they were "Not effective at all" or "Slightly effective" building a relationship with amateur astronomers (Figure 10). This is in part echoed by community-based organization staff with 28% of those survey respondents "Strongly disagreeing" or "Disagreeing" that their organization and their amateur astronomers work well together (Figure 11).

Informal science institution and community-based organization staff survey respondents cited barriers in securing amateur astronomer attendance at events and working together, including:

- Not having a large enough pool of amateur astronomers to reach out to for events.
- Older adults who may be at higher risk of illness and feeling wary of the potential health risks from being around groups of people (e.g. COVID-19).
- Finding amateur astronomers who are available to attend events.
- Securing amateur astronomers who are interested in or comfortable working with youth.
- Finding amateur astronomers who do not charge a fee for participating.

> "I had difficulty finding [an astronomer] who was available on the applicable dates/time, confident/willing to present to a wide-ranging audience, and flexible/knowledgeable to present the content being presented versus their own niche interests."
>
> *– Community-Based Organization Staff Survey Respondent*

Amateur astronomer interviewees described that a main challenge was needing to use their own funds to pay for gas and the cost of materials to participate in Mission2Mars events. They reported that this limited their interest in attending events that were far away, as they were generally not reimbursed for the cost of gas for long distances.

However, going forward, there is interest from both informal science institution and community-based organization staff survey respondents to work with amateur astronomers. Informal science institution staff survey respondents want more help finding amateur astronomers and want to learn about how to gather support from local astronomy groups. Similarly, community-based organization staff survey respondents want amateur astronomers at their events, especially to help answer in-depth astronomy-related questions from children and families.

> "We would love to have an actual astronomer. We have tried over and over but no success as of yet."
>
> *– Community-Based Organization Staff Survey Respondent*

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Figure 9. A majority of informal science institution staff survey respondents "Agree" that amateur astronomers play an important role in the program.[9] (n = 14)

Figure 10. Fifty-seven percent of informal science institution staff survey respondents feel "Not effective at all" or "Slightly effective" developing or maintaining a relationship with amateur astronomers. (n = 14)

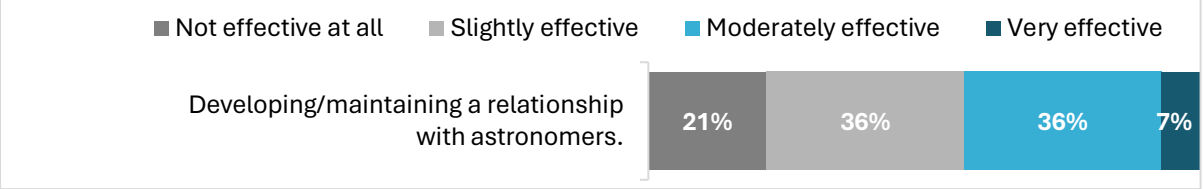
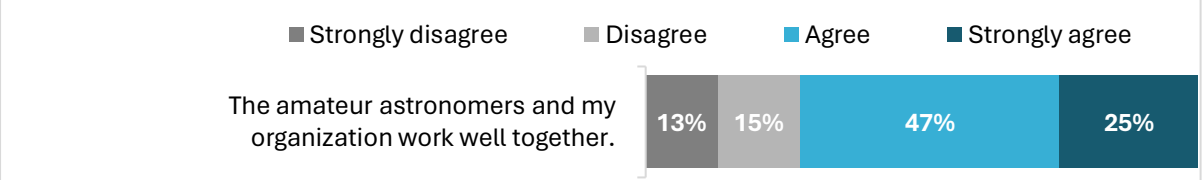


Figure 11. While almost one quarter (72%) of community-based staff survey respondents "Agree" or "Strongly agree" that they work well with their amateur astronomers, over one quarter (28%) "Strongly disagree" or "Disagree." (n = 53)



[9] No respondents selected "Strongly disagree."

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7. Mission2Mars events attracted participants who were new to space-themed programs and to community-based organizations, and these audiences enjoyed events and learned about the Artemis program and career opportunities in STEM.

Mission2Mars events engaged audiences who were new to space-themed programs and new audiences for community-based organizations. Over half (62%) of event survey respondents reported that they have never attended a space program before and similarly, community-based organization staff survey respondents reported engaging new audiences.

During Mission2Mars events, survey respondents reported high satisfaction. Ninety-six percent reported being "Happy" or "Very happy" with their event (Figure 12). Additionally, 82% felt "Very welcome" at events (Figure 13). They reported learning about Artemis and career opportunities in STEM, with 76% reporting that they know "A little more" or "A lot more" about Artemis (Figure 14) and 85% reporting that they know "A little more" or "A lot more" about career opportunities in STEM after their event (Figure 15). At the same time, 9-10% of respondents reported that they "didn't learn anything new" at their events. Event survey respondents highlighted that the most memorable aspects of the events were the hands-on activities and projects that they engaged in, along with learning about space-related content.

> "[I will remember most that] my kids absolutely adored it! They're little, so we didn't spend too much time on the technical stuff, but they had so much fun! Thanks for making science cool!"
>
> *– Event Survey Respondent*

Figure 12. Ninety-six percent of the event survey respondents reported that they were "Happy" or "Very happy" with their event.[10] (n = 190)

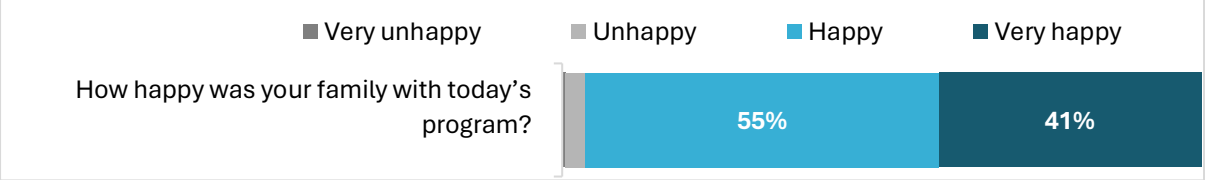
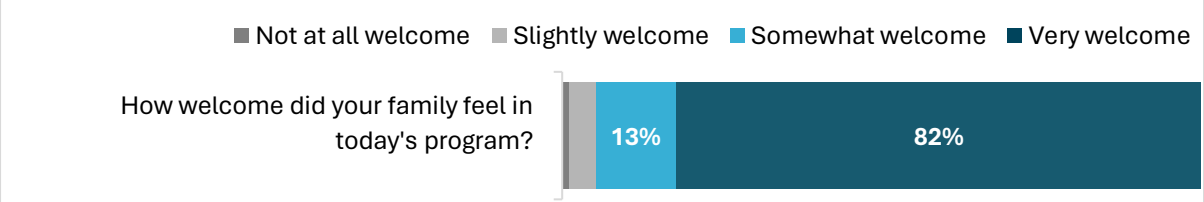


Figure 13. Eighty-two percent of event survey respondents reported that they felt "Very welcome" at events.[11] (n = 190)



[10] Event survey respondents who selected "Very unhappy" or "Unhappy" represent 4% of respondents.
[11] Event survey respondents who selected "Not at all welcome" or "Slightly welcome" represent 5% of all respondents.

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Figure 14. Most event survey respondents reported knowing "A lot more" or "A little more" about the Artemis program. (n = 186)

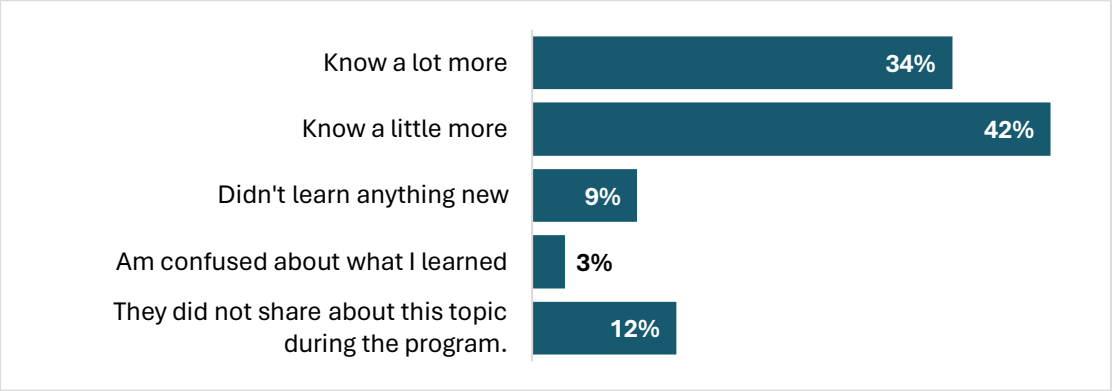
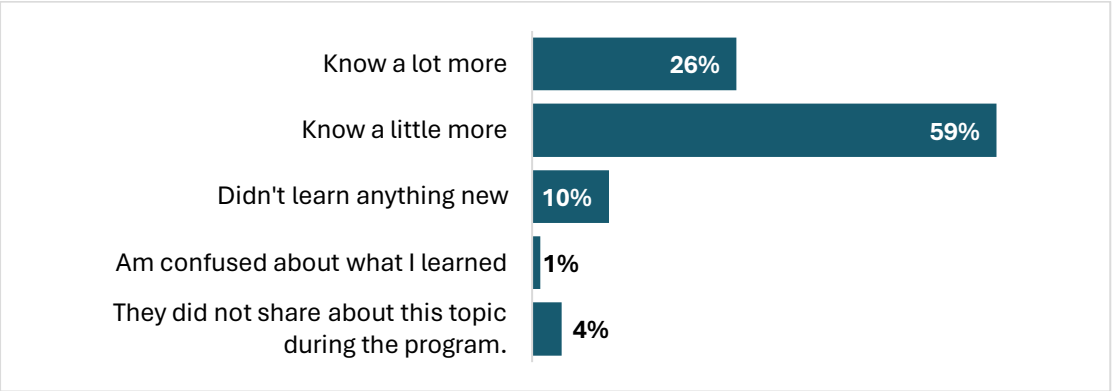


Figure 15. Most event survey respondents reported knowing "A lot more" or "A little more" about career opportunities in STEM. (n = 184)



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Considerations and Next Steps

Based on insights from the Year 2 evaluation, we offer the following overarching themes and related reflection questions for The Franklin Institute's consideration for the final year:

Themes

- Informal science institution staff are making adaptations to their training to suit the levels of expertise of their audience. There is evidence to suggest that these staff are inconsistently training community-based organization staff on Artemis information.
- Community-based organization staff are making adaptations to the Mission2Mars activities so that the activities suit a range of ages and can be implemented with different program formats (e.g., stations). However, there is evidence to show that not all community-based organization staff are receiving the necessary materials for activities.
- Informal science institutions and community-based organizations are making new connections, forming new partnerships, and reaching new audiences.
- Informal science institution staff perceive amateur astronomers to be important to the program, but there are continued barriers to their participation in the program. There may be an opportunity to further clarify expectations around working with amateur astronomers and the role they play in the program.
- Attendees at Mission2Mars events are generally satisfied and are learning information about Artemis and careers in STEM. However, given that event survey responses are largely representative of one informal science institution, there's room to further understand event participant experience across the informal science institutions.

Reflection questions

- Are there opportunities for informal science institutions and The Franklin Institute to highlight and encourage program modifications (e.g., offering suggestions for how to simplify activities for younger participants or ways to adapt activities to a station-style format)?
- How can The Franklin Institute further support relationship-building with amateur astronomers? Who is the best fit to serve as an amateur astronomer?
- What does sustainability of the Mission2Mars program look like?

Going forward

With these considerations in mind, the Year 3 evaluation will collect data via annual surveys and focus groups. The evaluation team will work with The Franklin Institute to refine the survey questions and develop focus group protocols to delve more deeply into understanding the sustainability of the program, how relationships have evolved, and what participants have gained from the program trainings and events.

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