Co-creating with Communities Summative Evaluation

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Project meeting in Mesa, AZ. Image credit: Ethan Kruszka for NISE Network

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Table of Contents

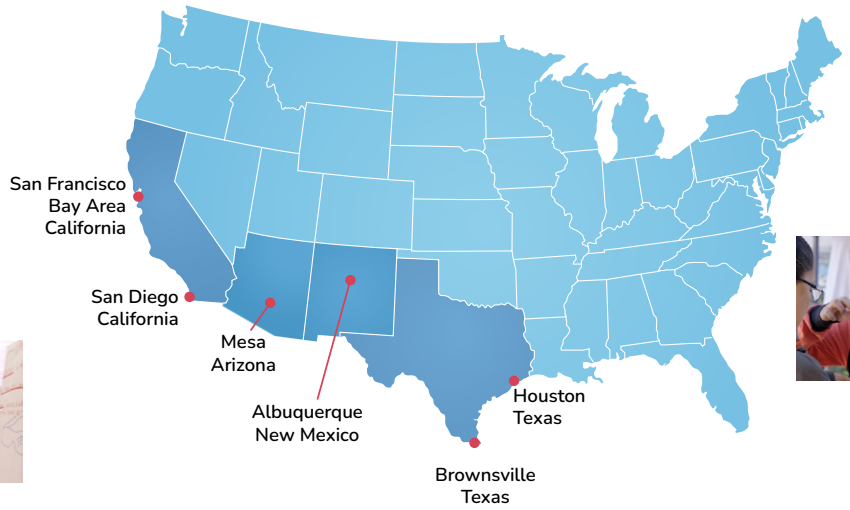
CO-CREATING WITH COMMUNITIES

Co-creating with Communities

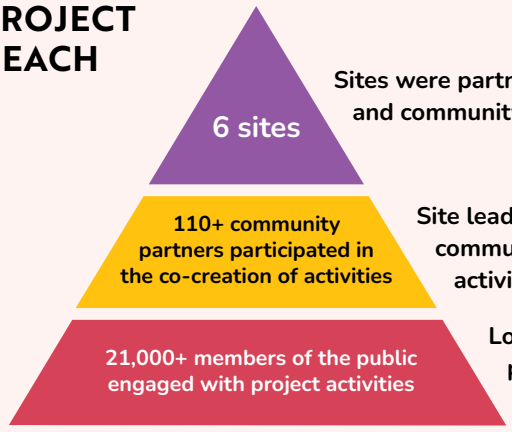
Summative Evaluation

Project summary

The Co-creating with Communities project brought together educators, community members, and subject matter experts to connect STEAM (science, technology, engineering, arts, and math) with local places and community assets. Collaborators at six sites co-created unique learning experiences that explored NASA Earth and space science and reflected family and community values and priorities. Over the course of the project, these six sites broadened participation in the creation of STEAM activities to engage members of the public in Earth and space science.



PROJECT REACH



Sites were partnerships of education and community-based organizations

Site leads brought together community partners to co-create activities and experiences

Local audiences engaged with activities, programs, and events developed through this project

Grantee

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Partnerships

Most of the sites focused their work on having an impact on youth and families through partnerships between informal science organizations and two types of partners: local business leaders or local nonprofits that serve youth.

SAN FRANCISCO BAY AREA, CA

Activities
Supporting young program staff to develop and deliver hands-on Earth and space activities at afterschool programs in the East Bay

Partners
Lawrence Hall of Science and Bay Area Community Resources

SAN DIEGO, CA

Activities
Featuring Earth and space science at the annual San Ysidro STEM Fair, providing hands-on activities in afterschool programs, and hosting family STEM nights at public libraries

Partners
Fleet Science Center, San Ysidro STEM Committee, and San Ysidro Education Collaborative

MESA, AZ

Activities
Identifying the rich STEAM knowledge that exists in the community and creating new opportunities for young people and families to explore Earth and space science at neighborhood events, out-of-school programs, city festivals, and parks

Partners
Arizona State University's Center for Innovation in Informal STEM Learning, Creative Community, Mesa Arts Center, Patchwork Community Inclusion, RAIL CDC, and a dedicated community co-creation group

ALBUQUERQUE, NM

Activities
Empowering young people to design and host a Youth Summit on the Future to shape ongoing programming and outreach activities related to Earth and space science

Partners
Explora Science Center and Children's Museum and Horizons Albuquerque

BROWNSVILLE, TX

Activities
Offering hands-on and digital learning experiences about space science and exploration at the children's museum, in local flea markets, and at community events such as the citywide Space Fests

Partners
Children's Museum of Brownsville, 9th Street Company, and Reybotics

HOUSTON, TEXAS

Activities
Co-creating a series of flexible activities and learning modules about Earth and environmental science to implement in summer camps, afterschool programs, and community events

Partners
Children's Museum of Houston and Community Family Centers

Summative evaluation overview

The summative evaluation focused on understanding:

1. How participation in the project impacted the sites' partnerships and capacities to co-create STEAM activities
2. How those activities impacted local audiences' sense of STEM identity, interest and engagement in Earth and space science, and perception of the relevance of STEM to their lives

Data were collected about partners through:

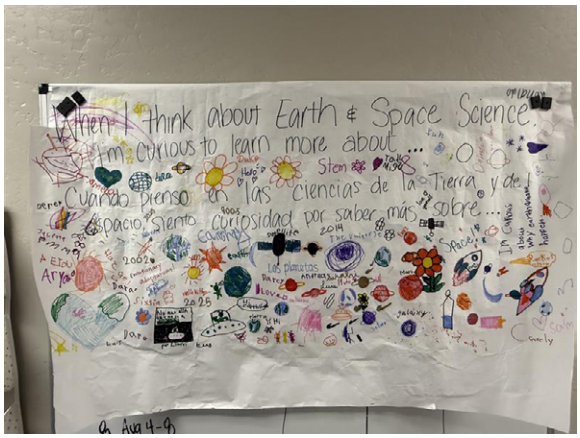
- Monthly site reflections
- Focus groups

This allowed the evaluation to document the work as it happened, pause for reflection, and plan next steps.

Data were collected from the public through:

- Flash interviews
- Drawing activities

Sites chose from a set of prompts to align with their community priorities.



Attendees at the San Ysidro STEM Fair participated in a drawing activity to share what they wanted to learn more about Earth and space content.

Contributing to SciAct objectives

The evaluation shows that the Co-creating with Communities project contributed to the achievement of NASA Science Activation's (NASA SciAct) Mid-Level Objectives related to:

- Inspiring interest in STEM and development of STEM identities through activities that provide opportunities to participate in NASA science using NASA SMD assets (1a, b, c)
- Increasing the participants reached by NASA SciAct through programming (3b)
- Leveraging internal and external mechanisms to support sharing and learning across the NASA SciAct and beyond the portfolio (4a, b)

Additional outcomes

The summative evaluation is just one piece of the story about the work and impacts of this project. The Co-creating with Communities team has also created videos about the project; presented at conferences and through online webinars; written peer-reviewed journal articles; and produced other resources which can be found on the NISE Network website.

https://www.nisenet.org/cocreatingcommunities

Personal and organizational impacts

Through the project, sites felt empowered to expand what counts as Earth and space science and add culturally relevant content and art into STEM activities. The team meeting held in October 2024 in Mesa, AZ was a turning point for how sites thought about incorporating locally-relevant context into STEM activities.

Doña Maria Ávila Vera and Isabel Hawkins teach professionals from the six sites about the science behind corn tortillas at the 2024 project meeting.

Families at a **San Francisco Bay Area** engagement event learn about how natural materials from their local environment can be turned into pigments.

All sites broadened participation by expanding who creates Earth and space science activities and who sees themselves as a STEM practitioner. They experimented with new ways of partnering and co-creating alongside their local community, leading to meaningful community-engaged work.

Members of the local co-creation group and project team stand beside the interactive artwork they created highlighting STEM careers in **Mesa.**

The **Brownsville** team brought Earth and space science activities to their local flea market and asked families for feedback.

> *"As owners of the local 77 Flea Market, we see firsthand how important it is to bring meaningful opportunities directly into the community. The Children's Museum of Brownsville did exactly that by bringing bilingual, engaging STEM experiences where they already feel comfortable and welcome... Children were excited to see themselves reflected in conversations about space exploration..."*
>
> **– BROWNSVILLE FLEA MARKET OWNER**

While the professionals at the sites were already comfortable with STEM engagement, the project increased their knowledge of Earth and space science within their local context. Many sites used the project to foster leadership beyond the core partners.

Families in **Houston** wanted to learn more about testing for pollution in their area. The team responded by developing locally relevant STEM activities such as a soil testing activity.

The **San Francisco Bay Area** team formed a sub-group of afterschool teachers, called Las Estrellitas, and students to co-create STEM activities about Earth and space science.

Broad audience impacts

Project activities had a positive impact on public participants' sense of science identity, interest or engagement in STEM, and perception of the relevance of STEM. Impacts varied by site, with select examples shared below:

INTEREST IN EARTH AND SPACE SCIENCE

Most attendees at the San Ysidro STEM Fair reported that there was something from the event that sparked their interest in STEM or they wanted to learn more about.

> *"Me gustaria aprender mas sobre ciencia de la tierra." (I would like to learn more about Earth science.)*
>
> – SAN YSIDRO STEM FAIR ATTENDEE

FEELING ABLE TO PARTICIPATE IN SCIENCE

Houston families reported increased excitement, confidence, and future aspirations in STEM after using project activities.

> *"Opening our daughter's eyes to STEM has pushed her to be curious about engineering."*
>
> *"My son wants to be an aerospace engineer."*
>
> – COMMUNITY FAMILY CENTERS PROGRAM PARTICIPANTS

RELEVANCE TO DAILY LIFE

Albuquerque youth felt that the Youth Climate Summit was relevant to their lives, connecting with the varied backgrounds of the speakers at the event.

> *"A lot of us found connections at the event, with people of different backgrounds. Being able to experience what different people had to say was good."*
>
> – PARTICIPANT FROM THE YOUTH CLIMATE SUMMIT

Continuing the impacts of the project

Professionals at the six sites have used what they learned in this project about community engagement as a model for other work at their organizations, including sustaining the work beyond the project grant period.

In **Albuquerque,** the Youth Summit on the Future brought together local teens to discuss challenges and find solutions. The site plans to use the youth summit format beyond the Co-creating with Communities project to engage local youth on issues that impact their lives.

The **San Diego** team used the Co-creating with Communities project to think about how they could share ownership of their library's intergenerational STEM nights with other local organizations like the Girl Scouts.

Image sources: Futuremundo and Swift Creek Media.

1. Introduction

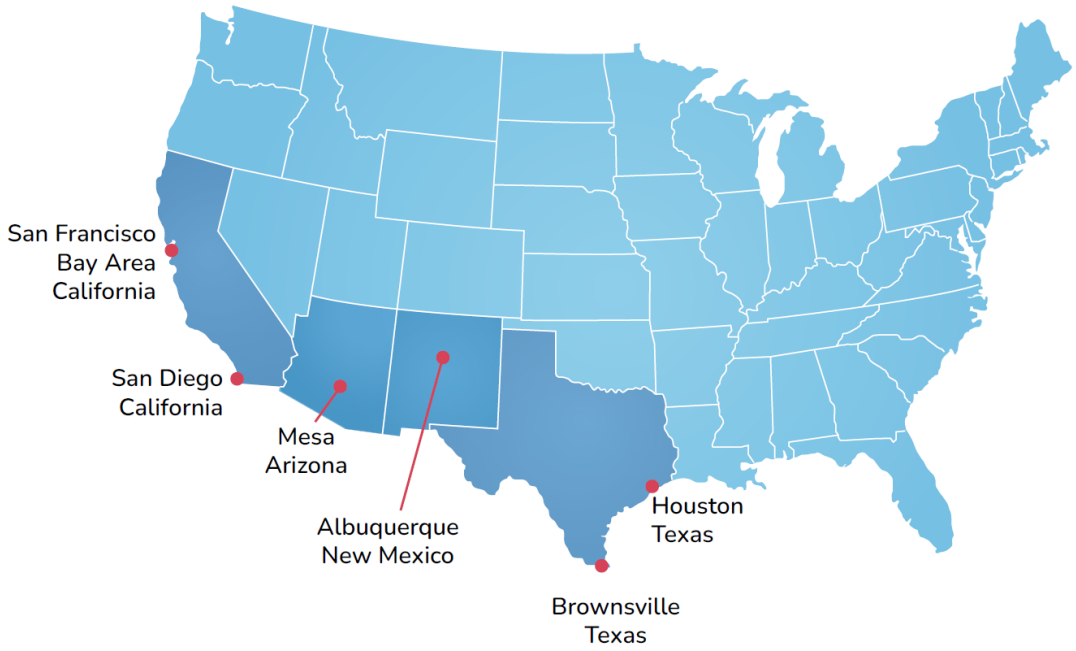
1.1 Project overview

The *Engaging Hispanic Communities in Authentic NASA Science: Broadening Participation in Science Activation through Local Partnerships and National Networks* ("Co-creating with Communities") project brought together educators, community members, and subject matter experts to connect STEAM (science, technology, engineering, arts, and math) with local places and community assets. Collaborators at six locations worked together using co-creation and community engagement approaches to develop unique learning experiences that explored NASA Earth and space science and reflected family and community values and priorities. Over the course of the project, these six sites broadened participation in the creation of STEAM activities to engage members of the public in their local areas in learning about Earth and space science.

1.2 Team overview

The Co-creating with Communities project had teams at six locations across the Southwest United States, see Figure 1. These site teams were comprised of partnerships between informal STEM education and community-based organizations. Some teams also worked with additional community partners, including educators or local business owners, to co-create hands-on public engagement experiences. Local audiences then engaged with the activities, programs, and events developed through this project to learn about Earth and space science. These partnerships and activities are described briefly on the following page, and through detailed case studies in Section 3, beginning on page 12.

Figure 1. Six site teams located across the Southwestern United States



San Francisco Bay Area, CA

Activities: Supported program staff to develop and deliver hands-on Earth and space activities at afterschool programs and other community engagement programs.

Partners: Lawrence Hall of Science and Bay Area Community Resources

Albuquerque, NM

Activities: Empowered young people to design and host Youth Summits to shape ongoing programming and outreach activities related to Earth and space science.

Partners: Explora Science Center & Children's Museum and Horizons Albuquerque

Mesa, AZ

Activities: Identified the rich STEAM knowledge that exists in the community. They created opportunities to explore Earth and space science at neighborhood events, out-of-school programs, city festivals, and parks.

Partners: Arizona State University's Center for Innovation in Informal STEM Learning, Creative Community, Patchwork Community Inclusion, RAIL CDC, and the Mesa Arts Center, alongside a dedicated community co-creation group

San Diego, CA

Activities: Featured Earth and space science at the annual San Ysidro STEM Fair. The team also provided hands-on activities in afterschool programs, and hosted family STEM nights at public libraries.

Partners: Fleet Science Center, San Ysidro Education Collaborative, and San Ysidro STEM Committee

Houston, TX

Activities: Created a series of flexible activities and learning modules about Earth and environmental science to implement in summer camps, afterschool programs, and community events.

Partners: Children's Museum Houston and Community Family Centers

Brownsville, TX

Activities: Offered hands-on and digital learning experiences about space science and exploration at the children's museum, in local flea markets, and at community events such as the citywide Space Fests.

Partners: Children's Museum of Brownsville, 9th Street Company, and Reybotics

1.3 Project Meetings

The core project leadership team, composed of individuals from Arizona State University's (ASU) Center for Innovation in STEM Learning; Garibay Group; the National Informal STEM Education (NISE) Network; and Museum of Science, Boston, held multiple in-person and virtual project meetings throughout the project to support the six sites in co-creating STEAM public engagement experiences about Earth and space science of interest to their local communities. The project also collaborated with the NASA-funded *Sparking Interest in STEM* project, a complimentary co-creation Earth and space project located in North Carolina and led by the Museum of Life and Science, NC.

Kickoff Meetings – February and May 2023, Tempe, AZ:

A launch meeting for Co-creating with Communities was held February 2023 in Tempe, AZ. The purpose was to introduce the sites to the project and each other. Team members from the Mesa, Brownsville, and Houston sites attended the meeting. The meeting also included advisors, NASA experts, evaluators, members of Sparking Interest in STEM, and other public engagement professionals from the Phoenix and Mesa area. The teams from the San Francisco Bay Area, San Diego, and Albuquerque were not added to this project until shortly after the February meeting, so a similar meeting was held for these groups in Tempe, AZ in May 2023.

During this meeting, participants learned about and discussed topics that were going to be of importance throughout the project. For example, staff from the Museum of Life and Science, the Museum of Science, Boston, and ASU talked about examples of co-creation processes they had used in past projects so that the teams could begin to think about ways to involve their communities in the development of their project deliverables. Additionally, Cecilia Garibay and Veronica Garcia-Luis presented on the Cambio project[1] and introduced the concept of *Comunalidad* to help the teams think about how to integrate locally relevant content into their activities. Comunalidad is a framework for thinking about STEM engagement developed by Oaxacan philosopher Dr. Jaime Martínez Luna and colleagues, which shifts the focus from individual to shared learning and centers feelings of belonging among participants (Hawkins, 2025; Hawkins & Ávila Vera, 2021).

Team Meeting – October 2023, Charlotte, NC:

The Co-creating with Communities team held a project meeting with all six sites in October 2023. This meeting was held following the Association of Science-Technology Centers (ASTC) Conference in Charlotte because team members from many of the sites were already attending that conference. The purpose of this meeting was to further strengthen relationships among team members from the six sites as well as give the sites a chance to share progress and challenges, reflect on their plans, and begin to develop goals using concepts from co-creation and Comunalidad as a starting point. During this meeting, teams were given opportunities to talk with team members from other sites during breakout discussions. The evaluation team introduced team-based inquiry (Pattison et al., 2014), an evaluation approach designed for non-evaluators to collect useful data to improve experiences, with the expectation that this approach could be used by sites to conduct formative evaluation on their activities, events, or other experiences.[2] Additionally, Earth and space activities developed by the Sparking Interest in STEM project and the NISE Network were shared with the group to get feedback and help spark ideas for their own work.

[1] The project website for Cambio is cambioexperience.org

[2] Learn more about team-based inquiry on the NISE Network website: www.nisenet.org/tbi

Team Meeting – October 2024, Mesa, AZ:

In October 2024, team members across the six sites gathered to share progress on their projects, discuss challenges, and reflect on the support they needed as the work continued to move forward. This gathering used a range of techniques to engage the group more deeply and personally, affording greater exploration around the cultural roots of STEM. These techniques included opportunities for participants to share more of themselves as individuals, not just their professional identities, and share what they were learning in their project through storytelling. Together these meeting activities were designed to support thinking about more holistic approaches to STEM learning opportunities.

Dr. Isabel Hawkins, from the Exploratorium, and Doña María Ávila Vera, a Mayan elder, presented an interactive program that created a dynamic environment for group involvement. The two guided attendees through the rich cultural history, science, and art that can be found in the process of preparing corn tortillas. Hawkins and Ávila Vera's interactive demonstration exemplified how educators may effectively integrate science and culture while also making the material more inclusive and relevant to their local communities.[3]

Team Meeting – November 2025, Tempe, AZ:

In November 2025, a small group of team members across the six sites convened for continued discussion of project progress, community building, sharing within the cohort, and reflection. A highlight of this convening was a "River of Life" professional learning activity where each site used a river and its myriad of geological features to reflect on their partnership over the past 2+ years of the project. The river allowed each site to represent the unique challenges and opportunities of co-creating within their local context. During the meeting, the teams started to share plans for their work beyond the funding available through the Co-creating with Communities project.

Virtual Meetings

Throughout the project, sites met roughly quarterly each year. The virtual meetings complemented the in-person convenings, providing opportunities for the sites to meet and share their insights with each other. A highlight of these quarterly meetings was "one picture, one story" report-outs in which sites picked one accomplishment from the previous quarter to update the group. They also served as opportunities to share best practices or workshop challenges. For example, when one site talked about the importance of using local vendors at one of the early quarterly meetings, other sites saw that as an opportunity to do similar work in their locations to build greater local connections and trust in the project.

1.4 Project Reach

The Co-creating with Communities project reached many public and professional audiences. At the core of this work were the six sites, with each site having at least two partnered organizations – education and community-based organizations – and many individuals contributing to the work. Over 110 individuals were a part of these core site teams including staff at the core organizations, along with additional partner groups such as the co-creation group in Mesa or afterschool educator group (Las Estrellitas) in the San Francisco Bay Area. These individuals participated in the co-creation of engagement experiences at the six sites. Beyond the

[3] More details about the meeting were shared through a NISE Network Partner Highlight: www.nisenet.org/blog/post/october-2024-gathering

individuals directly involved in the project, additional staff at the participating organizations were involved in event planning, activity facilitation, and more, but not included in the reach estimate. Local audiences engaged with the activities, programs, and events developed through this project. These activities ranged from listening sessions and prototyping of hands-on activities at the beginning of the project to large public events with multiple experiences offered. Across the project, at least 21,000 members of the public engaged with project activities, such as hands-on engagement activities, programs, and events (see Figure 2).

Figure 2. Project reach

Conference and Webinar Presentations

Insights from the project were also shared in NISE Network webinars, at NASA SciAct meetings, and at professional conferences, reaching the broader informal STEM education community. Presentations and posters typically focused on sharing learnings from working with the process of co-creation and community engagement and were led by core project leadership along with representatives of the site teams. Conferences included American Alliance of Museums (AAM), American Geophysical Union (AGU), Association of Children's Museums (ACM), Association of Science and Technology Centers (ASTC), ECSITE, National Rural STEM Summit, Society for Advancement of Chicanos/Hispanics & Native Americans in Science (SACNAS), Visitor Studies Association (VSA), and more. These professional engagements reached at least 1,300 people throughout the course of the project. Webinar recordings and more are available at www.nisenet.org/cocreatingcommunities.

2. Methods

The evaluation focused on two core audiences: the professionals that formed the partnerships at the six sites and understanding the impact on the individuals and the organizations involved in the co-creation process; and the public that they sought to engage in locally relevant Earth and space science content. Summative evaluation protocols were reviewed and approved by the Heartland Institutional Review Board, under project number 10312023-518.

2.1 Evaluation Questions

Three evaluation questions guided the summative evaluation. They were:

1. What kinds of partnerships are formed through project participation, and how have sites leveraged their partnerships to do work for this project?
2. How has participation in the project impacted sites' capacities or the work that they are doing together? Through the lenses of:
    a. Cultural relevance / culturally sustaining experiences that are embedded in local context
    b. Integration of STEM / STEAM content
    c. Co-creation or ways of partnering with others
    d. Personal growth (e.g. in leadership, understanding of STEM / STEAM)
    e. Organizational growth in leadership
3. How does engaging with project activities impact public participants':
    a. Sense of science identity;
    b. Interest / engagement in NASA (Earth / space) science content; and
    c. Perception of the relevance of STEM to their personal life?

2.2 Data Collection Methods

Partners/Professional audiences

Data were collected about partners through monthly site reflections and focus groups. This plan allowed the evaluation to document project work as it happened, pause for reflection, and plan the next steps.

At monthly reflections (see Appendix A: Professional audience instruments), the evaluation team documented each site's process as they shared insights about their project work. Sites chose an online format for reflection that worked best for them: a) Miro boards (an online collaborative software tool with options for creating sticky notes, diagrams, and images) that allowed for a more visual/collaborative interface; or b) a shared Google Doc where the evaluation team kept running notes allowing group members to focus on the verbal conversation.

Each meeting began with the evaluator leading the team through a member checking discussion where a summary of the key takeaways from the previous month was shared and the site told the evaluator if it was accurate or needed to be changed (Koelsch, 2013). The evaluation team also provided themes and topics for groups to discuss (see Table 1). The idea was that these reflections would support the evaluation team in assessing the evaluation questions while also helping to support sites in their planning and co-creation processes. These monthly reflections took place from April 2024 through December 2025. After data were collected, the evaluation team wrote summaries for each site and met with their teams to member check how their site was being represented in the case studies.

The consistent presence of the evaluation team in these monthly reflections allowed the evaluators to build trust with the sites. Thus, we feel that these monthly reflections helped the teams to feel more comfortable and participate in deeper conversations than they might have otherwise. Regular meetings also allowed the evaluators to be responsive to the group and adapt these reflections in a way that worked best for each site's communication style so that the site leaders could engage in these conversations more authentically. Monthly meetings supported the evaluation team and the project leadership in better understanding site needs, allowing them to address issues as they arose.

Table 1. Example reflection activity and prompts that were part of the monthly check-ins with sites

Activity	Question Prompts
Every month: Reflection Activity	• What went well? • What didn't go so well? • What is still challenging for us? • What did we learn?
September 2024: Expected Impact Activity	• What impact or changes are you hoping to see within participants? • What will these changes look like? What should we try to measure?

Besides the monthly reflections with the site leads, the evaluation team also conducted a focus group with the afterschool educators, called Las Estrellitas, at the San Francisco Bay Area site to understand their experience in co-creating public engagement experiences alongside the youth in their program, and to gain their insights on how the project activities impacted local audiences.

Public audiences

The evaluation team developed a set of shared prompts to support the sites in gathering data at their events about the impacts of their programming on public participants. The sites chose specific prompts to align with their community priorities and project goals. Two sets of prompts were created: (1) flash interview prompts for a short interview protocol of one close-ended and one open-ended follow-up question; and (2) drawing activity prompts that were designed to be used as an interactive data collection tool that would work in conjunction with public engagement experiences (see Figure 3). The drawing activity included a question or sentence to complete, and asked participants to write or draw their response. Generally, each site picked at least one flash interview question and one drawing activity prompt (see Appendix B: Public audience instruments). Sites teams identified staff or partners to support their data collection efforts and then shared the data with the evaluation team for analysis.

Figure 3. Set up for drawing activity at Brownsville, pens and sticky notes were provided for participants to use

2.3 Data Analysis

The case studies shared in Section 3 are summaries of the notes from the monthly site reflections, along with information from the quarterly or project wide meetings when applicable. Each case study also includes public impact data collected from a collection of the sites' major public outreach activities. These broad audience impacts summaries provide information about public perceptions of their experiences in interacting with the sites' offerings.

Partners/Professional audiences

Site summaries were collated by the evaluation team and presented to each site team over the 2025-2026 winter months. To create the summaries, the evaluators looked through all the monthly reflections for the site as well as notes from other meetings such as the quarterly meetings to answer prompts connected to the evaluation questions about each site's work. The summary prompts included:

1) Details on the partners involved in the project, their goals, and major public outreach activities;
2) A review of data available at each site that demonstrated how site activities impacted public perceptions of interest in Earth and space science, feeling able to participate in science, and perceived relevance of the public engagement experiences to daily life;
3) Themes around what happened within the project partnership during the Co-creating with Communities project;
4) How individuals' and the organizations' capacities to engage their local audiences in Earth and space science changed throughout the project; and
5) A summary of future directions the partners had planned (to the extent this information was known in December 2025).

The evaluators met with each site team to review their summary and provided them an opportunity to offer additional information or made corrections.

After creating the individual summaries for the case studies, the evaluation team met with each other throughout January and February 2026 to answer the summative evaluation questions by identifying common topics across the site summaries. Through this process, several cross-cutting themes were identified and presented to the sites at a quarterly meeting in March 2026. Sites were given the opportunity to provide feedback on these overarching findings, though no substantive changes were made. Throughout early spring, the evaluation team continued to write the case studies for each site and check the themes against the underlying data. These overarching findings are presented in the Discussion section starting on page 32.

Public audiences

Each site selected a unique set of prompts to evaluate their experiences via a flash interview and a drawing activity, so public audience data were largely analyzed on a site-by-site basis. Responses to close-ended questions were analyzed using descriptive frequencies. Open-ended interview questions and drawing activity responses were coded inductively (Patton, 2002). Since the drawing activity invited participants to draw on a shared surface and individuals could add multiple responses, themes were categorized by frequency rather than absolute counts. These findings are shared within this report in each case study, with overarching themes summarized in the Discussion section starting on page 32.

2.4 Limitations

Co-creation is not a linear process, nor did each site take the same approach to partnership. At times, the evaluation needed to pivot to meet site needs and priorities. Being responsive to the local context of each site is a strength that supported work with the individual sites, but it is also a limitation in that it made generalizing findings beyond the individual sites more difficult. We caution against making comparisons of the work and outcomes across sites, as this was not the focus of our work. Rather, this evaluation highlights that there are multiple paths to meaningful community-engaged work that will look different based on each site's contextual factors.

It should also be noted that the evaluation team was not embedded in the local contexts of the project sites. The evaluation team was based out of the Museum of Science, Boston, so met virtually with the site teams throughout the project due to the geographical distance. This distance made it impractical to support and document day-to-day shifts across the co-creation process, limited our ability to collect public feedback as the on-the-ground team was often the educators and community members hosting the experiences, and may have limited our ability to make stronger conclusions that could come from being more strongly tied to the communities served by these sites.

Importantly, the summative evaluation is just one piece of the story about the work and impacts of this project. The Co-creating with Communities team has created videos about the project, participated in webinars and conference presentations, and are working on peer-reviewed journal articles and other resources that can be found on the NISE Network website, www.nisenet.org/cocreatingcommunities.

3. Findings: Site Case Studies

The following case studies present findings from each of the six sites, drawn from a synthesis of professional reflections, focus groups, public feedback, and documentation collected over the course of the evaluation. Rather than offering comparisons across sites, these case studies highlight how co-creation took shape within distinct local contexts, partnerships, and community priorities. Taken together, these case studies demonstrate the diverse ways co-creation can support culturally relevant, community-driven Earth and space science engagement.

3.1 San Francisco Bay Area, CA

3.1.1 Project Overview

The San Francisco Bay Area team was primarily composed of professionals from the Lawrence Hall of Science and Bay Area Community Resources. Additional organizations including local libraries also participated. The Lawrence Hall of Science is a science center located on the campus of the University of California, Berkeley. Bay Area Community Resources is a community-based organization that provides a variety of services for individuals in the San Francisco Bay Area related to mental health, healthy communities and schools, workforce re-entry, and national service. The goals for the San Francisco Bay Area project were to broaden and deepen community partnerships, engage with community members not currently served, and connect with local Latino and Hispanic audiences in relevant and engaging ways. The team used listening sessions, conversations, sticker voting, and surveys to get feedback from Bay Area Community Resources' students and families, who went to a local library, about the topics to include in their hands-on activities.

The project team focused their efforts on children from kindergarten through grade 8 that attend Bay Area Community Resources' afterschool programming, particularly those located in Antioch, CA. A group of Bay Area Community Resources afterschool educators, called Las Estrellitas, co-created four STEAM hands-on activities related to Earth and space science with some of their students that they could use as a part of the afterschool program. These hands-on activities were also shared at the program's annual family engagement nights that introduce families to the Bay Area Community Resources' afterschool program. At the conclusion of this project, the team was thinking about ways to share these hands-on activities with other afterschool programs as well as modifying them for use by other science museums or at different community engagement events. They were also searching for new funding opportunities that would allow them to continue their work together.

3.1.2 Partnerships

The relationship between the Lawrence Hall of Science and Bay Area Community Resources was strong before this project began. The main partners from these organizations had already been working together for many years. However, while the Lawrence Hall of Science had a strong relationship with the Antioch location, they used this project as an opportunity to broaden their relationships with other Bay Area Community Resources sites as well.

Before this project, the Lawrence Hall of Science and Bay Area Community Resources had already created some STEAM public engagement programs together and had a development process in place that worked for them. They used this project to expand their engagement development processes by creating a group of afterschool educators in Antioch known as Las Estrellitas. While they were experienced educators, these individuals did not have much experience creating STEM hands-on activities for their afterschool programs before this project.

The project leads shared their existing engagement development process with Las Estrellitas, and they used this project to expand their process to add cultural content to the afterschool STEM activities and integrate more evaluation. The project leads worked closely with Las Estrellitas throughout the school year to develop STEAM hands-on activities with their students about STEM topics of local relevance. In the end, the group ended up creating four hands-on activities:

- **"Sacred Structures"** – participants were invited to build a Mayan pyramid and learn about the connection between the pyramids and the solstices;
- **"Painting with Nature"** – participants created pigments out of natural materials such as bugs, and used their pigments to create art;
- **"Mayan Calendar and Me"** – participants made their own Mayan calendar; and
- **"Sounds of the Aztecs"** – participants leaned about the Aztec death whistle.

Las Estrellitas got feedback from fellow educators and their students throughout the year and made refinements as they developed the hands-on activities. Their work culminated in the family engagement nights where they shared their hands-on activities with local families.

Figure 4. A member of Las Estrellitas and her students at a family engagement night.

Through this project, the team became more confident in their ability to add locally relevant content to their work as well as adding more evaluation to their development process. They said that the 2024 Mesa in-person meeting was critical to their understanding of how to integrate cultural context into their work, and that the Team-Based Inquiry (TBI) workshop helped them to think about how to add more formative evaluation into their activity development. Additionally, Las Estrellitas said that participation in the project impacted their confidence in their abilities to share STEAM content with their students, and that it increased their sense of accountability related to their work. It also increased their interest in learning about STEM and in creating STEAM hands-on activities.

3.1.3 Broad Audience Impacts

The San Francisco Bay Area team had goals for their public audience related to science identity, interest / engagement, and relevance. The team collected data from the public during two of the family engagement nights. In total, flash interviews were collected from 38 intergenerational groups at these events. Participants were also invited to participate in a sticky dot activity where they voted on the hands-on activity that they liked best and that made them want to learn more. Finally, Las Estrellitas took part in a focus group where they talked about the impacts of participating in this project on them as well as Bay Area Community Resources' students and families.

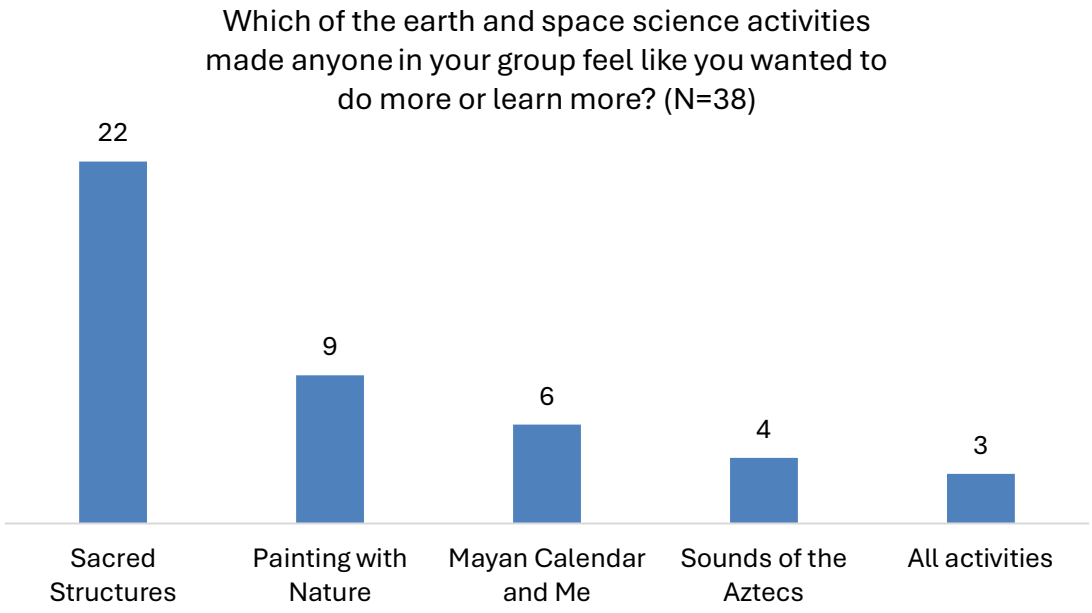
Figure 5. Families engaging in STEAM hands-on activities at a family engagement event

In terms of science identity, the San Francisco Bay Area team hoped that the experiences that they created would make participants: (1) feel proud of themselves and their culture / background; (2) have increased confidence that they can do STEM and share their STEM learning; and (3) confront gender biases about who can participate in STEM. During the focus group, Las Estrellitas said that they saw pride and growth in the students who participated in co-creating the hands-on activities with them. They also said that they saw the students take over facilitation of the hands-on activities during the family engagement nights. Additionally, they felt that they saw community pride in being able to share aspects of their local culture during the events. Beyond these data, the team said that they saw Las Estrellitas' confidence grow through their participation in the project. They also talked about how the students wrote them letters talking about the pride they had in participating in this project.

The team's goal related to interest and engagement was that the experiences would make participants have increased interest in STEM and in studying STEM. Participants were asked through the flash interviews which of the hands-on activities made them want to do more or learn more. Most commonly (22 of 38) respondents said that the "Sacred Structures" hands-on activity made them feel this way. All the other activities were chosen by 9 or fewer groups

(Figure 6). When asked what about the hands-on activities made them feel this way, groups most commonly (16 of 38 participants) said they wanted to do more or learn more because the activity was fun. Other groups said it was because they liked learning about ancient structures (7 of 38 participants) or liked learning about the connection between the sun and ancient sites (5 of 38 participants). Other responses were given by a smaller number of groups. Additional evidence that the project impacted participants' interest in STEM is that Las Estrellitas said that some of their students became involved in engineering camps or did extra research on scientists because of their involvement in the project.

Figure 6. Flash interview responses about which of the co-created STEAM hands-on activities the public found most interesting



Finally, the San Francisco Bay Area team had goals related to relevance. The team hoped that the experiences would make participants: (1) recognize STEM in their lives and learn about STEM careers; and (2) learn about different cultural perspectives on STEM. During the focus group, Las Estrellitas reported that the families felt joy in seeing their cultures represented in the hand-on activities. They also said that they saw their students connect their work co-creating the experiences to their schoolwork.

3.2 San Diego, CA

3.2.1 Project Overview

The San Diego team was composed of professionals from the Fleet Science Center and members of the San Ysidro Education Collaborative, particularly the San Ysidro STEM Committee. The Fleet Science Center is a community-focused, countywide science museum located in San Diego, CA. The San Ysidro Education Collaborative is a volunteer organization that supports educational opportunities within the San Diego neighborhood of San Ysidro. The San Ysidro STEM Committee is a sub-group within the San Ysidro Education Collaborative focused particularly on STEM education. A librarian from the San Ysidro Library, who was a member of

the San Ysidro STEM Committee, acted as the primary partner for the Fleet Science Center staff working on this project.

The San Diego project focused on multigenerational groups from San Ysidro, which is located near the border with Mexico. Many people in this neighborhood are binational, crossing into the US on Monday and going back to Tijuana, Mexico on Friday afternoon. Individuals are mostly Latino / Hispanic Spanish-speakers, and they are looking for English-Spanish bilingual resources. The primary objectives for this project were to:

- Engage and collaborate with the San Ysidro community, building on existing relationships with key players;
- Leverage current interest in Earth and space science and involve families in exploring their interests;
- Empower families to explore science, culture, and creativity together; and
- Help people understand that STEM is happening in their community.

In order to achieve these objectives, the San Diego team had two major activities. One of these activities was the San Ysidro STEM Fair (see Figure 7). This fair is held annually on the grounds of a San Ysidro school for local students and their families. This fair is planned by the San Ysidro STEM Committee, and it involves booths and hands-on experiences led by the STEM Committee, the schools, community organizations, STEM role models, and professionals. This event had been happening for four years and attracts thousands of participants. The other major public engagement experience was intergenerational STEM nights that take place at the local library on a regular basis. The San Diego team created some STEM programs specifically for the library events, which they later also used at the STEM Fair. The San Diego team gathered feedback from the local community early in the project to understand the kinds of STEM topics that were important to them. The Fleet Science Center plans to continue their work with the San Ysidro STEM Committee after the conclusion of the grant.

Figure 7. Families attending the 2025 San Ysidro STEM Fair

3.2.2 Partnership

The Fleet Science Center already had strong relationships with the San Ysidro community before this project started, particularly with the San Ysidro STEM Committee and the San Ysidro library. The team used this project as a chance to continue to build and strengthen their relationships. For example, the Fleet Science Center worked with the San Ysidro Education Collaborative to build trust and get buy in for the STEM Fair and help them understand the work of the San Ysidro STEM Committee. The Fleet Science Center worked with the San Ysidro STEM Committee to determine ways to share ownership of the STEM Fair with more committee members. Finally, the Fleet Science Center worked with the San Ysidro Library to create Earth and space programming for the intergenerational STEM nights and pull in more cultural aspects like Aztecs and farming.

At the beginning, the San Diego team talked about how they were hoping that the project would help them build their capacity to create hands-on activities for English-Spanish bilingual audiences and add locally relevant content. The team talked about how the 2024 Mesa in-person meeting was particularly important in helping them do this work as it supported them in thinking about new engagement ideas and how they could bring culture into STEM hands-on activities. They also talked about how this in-person meeting was the impetus for training other Fleet Science Center staff about the Comunalidad framework. The San Diego team said that participating in the Co-creating with Communities project helped them to expand their Earth and space programs beyond rocketry to include more topics like food science. They also talked about how this project increased their capacity to add cultural content to their public engagement programs.

3.2.3 Broad Audience Impacts

The San Diego team had goals for their public audience related to science identity and interest / engagement. Public data were collected at the 2025 San Ysidro STEM Fair by the *Promotoras* who are a local group that supported data collection at the STEM fair in the past.[4] In total, the Promotoras collected 161 flash interviews at the STEM Fair. Participants at the STEM Fair were also invited to take part in a group drawing activity (see Figure 8).

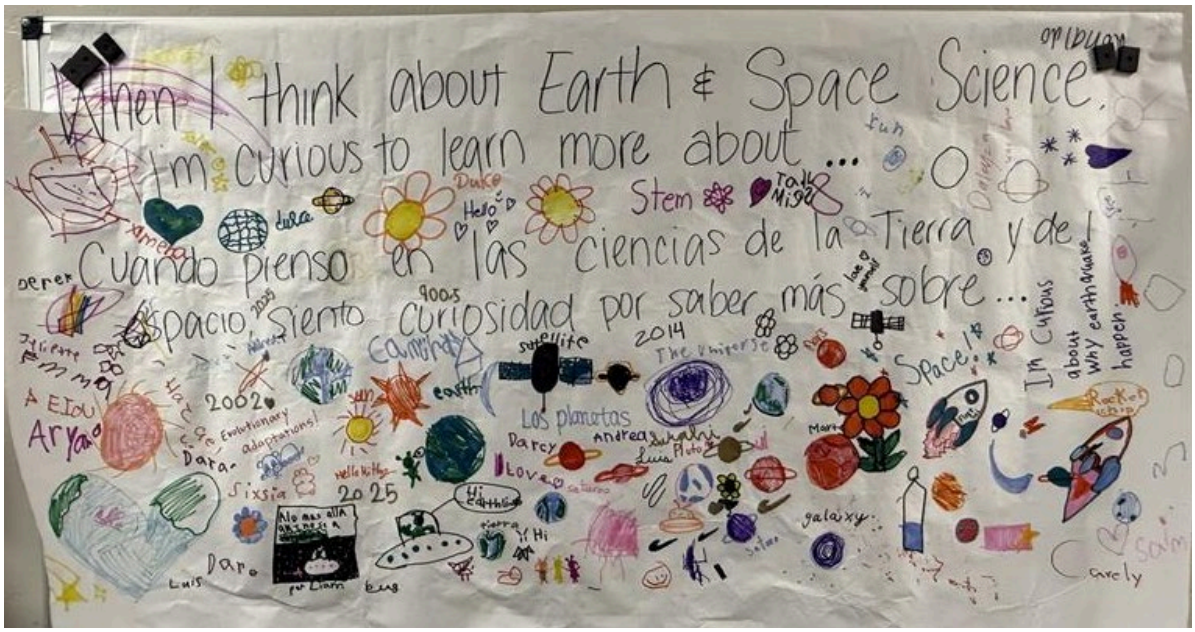
In terms of science identity, the San Diego team's goals were that the project activities would make participants (1) feel that STEM is something they can do and (2) want to come back for future events. On the flash interviews, 87% of respondents said that something during the STEM Fair made them, or someone in their group, feel like they could participate in science. In explanation to this response, groups most commonly said that the Fair's experiences made them feel this way (34 of 91), with the robotics hands-on activity being specifically named most often. One STEM Fair participant said, "Yes the robots, my son loved the robots. He like[d] controlling [them]." Other people said that the Fair made them feel this way because it was fun and interesting (13 of 91 responses), or it was educational and informative (12 of 91 responses). Beyond this evidence, the San Diego team noted that they observed repeated attendance by individuals to the San Ysidro STEM Fair, the library intergenerational STEM nights, or other events.

The San Diego team's goal for interest / engagement was that the experiences would make people interested in and curious about STEM. On the flash interviews, 63% of participants agreed that there was something from the event that sparked their interest in science or that they you wanted to learn more about. Similar to the science identity question, groups most

[4] Because of their prior experience conducting evaluations for the STEM Fair and intergenerational STEM nights, the evaluation team worked with the San Diego team to come up with the public evaluation methods and prompts for Co-creating with Communities.

commonly said that the hands-on activities or experiments made them feel this way (36 of 84), with groups calling out the robotics hands-on activity most frequently. The hands-on activities and information about Earth science were also commonly brought up. Beyond the hands-on activities and experiments, the STEM Fair participants said that everything (7 of 84 participants) or seeing children enjoying the fair (4 of 84 participants) made them feel this way. One of these participants said, "*Todo muy bonito y suave y interesante*." (Everything was nice, easy, and interesting.) Fair participants were also given the chance to participate in a drawing activity to show what Earth and space science content they are curious to learn more about. Analysis of this picture showed that a lot of participants (6 or more) were curious to learn more about topics like the Earth, the planets, or plants; and some participants (3-5) were curious to learn more about topics like stars or rockets (Figure 8).

Figure 8. A picture of the San Ysidro STEM Fair drawing activity

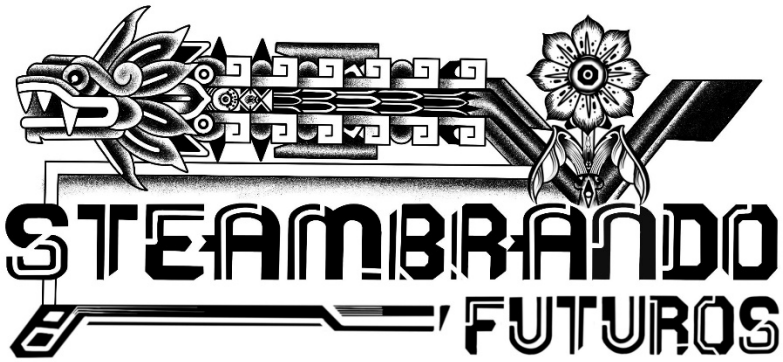


3.3 Mesa, AZ

3.3.1 Project Overview

Staff at Arizona State University's Center for Innovation in Informal STEM Learning partnered with community leaders at Creative Community; Patchwork Community Inclusion; Retail, Arts, Innovation & Livability Community Development Corporation (RAIL CDC); and the Mesa Arts Center to co-create experiences to engage families in multiple areas around Mesa, with a focus on neighborhoods near Guerrero and Whitman Parks. These organizations all do work building relationships with their local community by making connections to resources or opportunities, such as informal education opportunities, business assistance, arts experiences, and more. Some of these organizations had expertise leading co-creation groups or using co-creation frameworks. Together, these partners collectively adopted the name "STEAMbrando Futuros" and hired local artists to design graphics to reflect their vision (see Figure 9). The name is a play on the Spanish word *sembrando* (planting or sowing seeds) to suggest that their work together would plant the seeds of the future through STEAM learning.

Figure 9. STEAMbrando Futuros logo designed by local artist, Armando Rascon



The STEAMbrando Futuros team engaged the local community through multiple public engagement experiences and approaches. Early in the project, RAIL CDC held walking audits and *pláticas* in one of the local neighborhoods to engage locals in conversations about their communities. A plática is a culturally rooted, reciprocal conversational practice originating in Chicana/Latina feminist traditions, which treats everyday dialogue as a trusted, collaborative method for sharing experiences and co-creating knowledge, and is used to gather data similar to what might be collected through a structured, researcher-led interview (Ayala Chavez, 2025). The team used these events as opportunities to connect with the community and introduce STEM language and this project. This led to development of the co-creation group, comprised of community connectors, cultural leaders, local business owners and others from the community, that gathered to act as consultants, planners, activity developers, activity facilitators, and more for the project. Alongside this work, the team also engaged families using Earth or space science-related activities at park pop-up events and local youth centers like Escalante. During these events, facilitators had conversations with families to gauge familiarity and interest in STEM or Earth and space topics. Ultimately, the goal of the STEAMbrando Futuros team was to build and strengthen relationships with Hispanic/Latino communities in Mesa to make conversations about STEAM topics more accessible. This included recognizing connections between STEAM topics and their everyday lives; recognizing STEAM practitioners in their community; and sparking curiosity about Earth and space science.

Using what they learned through these efforts, the STEAMbrando Futuros team developed or modified hands-on activities that focused on foundational conversations about culture and science or practicing science skills. This work culminated in repeated presence at large special events, such as the Día de los Muertos (Day of the Dead) celebration and Celebrate Mesa, where they facilitated activities such as:

- **"Ancestral Astronomy"** – a hands-on activity that was modified to combine cultural traditions of sky gazing; metalworking traditions such as the Mexican *hojalata* tin art; and the use of commemorative medallions used by NASA.[5]
- **"STEAM Career Tree"** – a facilitated activity developed by the co-creation group that highlights careers that use STEAM knowledge in their local community. Facilitators prompted conversations about different aspects of STEAM (science, technology, engineering, art, or math) and asked participants to think of other jobs that connect to these disciplines, see Figure 10.

[5] www.nisenet.org/ancestralastronomy

- **"Science in my Life"** – a conversation starter designed by the co-creation group that used artistic illustrations of STEAM-related careers to have conversations about where STEAM shows up in people's daily lives.
- **"Design a Spacecraft"** – a classic engineering design hands-on activity where participants build a device to fly or hover in a wind tube. With older, more engaged children, facilitators would make connections to NASA and spacecraft.

Figure 10. Facilitating the STEAM Career Tree activity and examples of leaves

Work completed during the Co-creating with Communities project was part of larger efforts in the Mesa community. Previous work in the community made the partnerships in this project possible, which in turn supports future work together. The team intends to use the STEAMbrando Futuro branding beyond this project and continue to connect the local community with Earth and space science or futures thinking. The relationships developed through this project will have a positive ripple effect beyond this content area. For example, these relationships were already leveraged to win a grant to design and install a crosswalk and mural at one of the parks.

3.3.2 Partnership

The community has been an active partner in the STEAMbrando Futuros team, in how feedback was gathered, who was involved, and how the work came together. The community organization partners were already trusted in the neighborhoods, and as they took on a lead role, they were able to build on existing relationships to move project work forward and develop deeper community connections. Relationships from prior work with RAIL CDC supported the walking audit, which later supported creation of the co-creation group, which in turn supported engagement with the broader community. This "chain of trust" built willingness for potential partners and audiences in the community to get involved in new projects or experiences.

The co-creation group became an additional partner group in the project. Comprised of local business owners and community members not associated with the named organizations for the project, these group members were compensated for their time to recognize their valuable contributions. Additionally, the team hired local business owners for catering, printing, activity fabrication, artwork, and more, reinforcing their commitment to the local community. Most broadly, discussion with people in the community during pop-up events informed focus areas and directions for the project. The outcomes included bringing hands-on STEM activities to pop-up events and talking to people about interests or connections to STEM topics, while

building relationships in the community. Repeated presence appeared to support durability of relationships and interest in engaging in STEAM activities.

Throughout this project, the STEAMbrando Futuros team focused on the process of building trust and relationships, which allowed them to follow the interests and focus of the community. During the project, the team reflected on how early ideas to create workshops related to Earth science would not connect with audiences without the foundational work of helping people understand existing connections between their lives and STEAM topics. As part of the process, the core team expressed greater comfort in stepping back and being in a support role rather than leading the work. They learned how to balance co-creation in a way that did not create a culture of experts and non-experts, while also recognizing the different knowledge and experience different people have. The team also recognized their obligation to responsibly commit to what the project could or could not complete within the overall project focus and resources available. This involved not over-committing and finding ways to stay engaged when plans needed to change. For example, narrowing down the many ideas the project team was excited about, or figuring out how to address aspirations of the co-creation group that were outside the scope of what this project could accomplish in the time available (e.g. interest in workforce development).

3.3.3 Broad Audience Impacts

The most effective information gathering was done through casual conversations with people throughout different events during the project, so evidence of broad audience impacts was primarily collected through team and facilitator reflections. Overall, the STEAMbrando Futuros team reflected that connections to NASA sparked participants' initial desire to engage with this project. The reputation and legitimacy of being connected to NASA gave people an initial "in" for STEAMbrando Futuros, whether in the early development stage and getting involved in the co-creation group or later people coming up to the booth at events.

Specific goals around impacting science identity included people recognizing STEAM practitioners within their community and having confidence that they can do STEAM by recognizing that it is already part of their everyday lives. The site leads reported that the co-creation group, as both a project partner and individuals in the community, were more confident in understanding what was meant by "STEM" and seeing that in their own work. After the Día de los Muertos event, facilitators' reflections shared that families had long conversations about careers while using the tree activity.

Their goal related to interest and engagement with NASA Earth and space science focused on sparking curiosity about Earth and space science, while using related engagement activities. During events, facilitators reflected that older children had long dwell times using "Design a Spacecraft," a classic engineering design hands-on activity and had conversations about space-travel related challenges. Facilitators also shared that families would recognize or seek out the STEAMbrando Futuros booth, leading to repeat visitation and engagement with activities across multiple events. In one case, a child went to every session at Escalante, a community center offering out-of-school time care, and then brought their parent to one of the large public events. When seeking feedback directly at an event using the drawing activity with the prompt "When I think about Earth and space science, I am curious to learn more about…" participants commonly drew pictures of planets, stars, and rocket ships and facilitators noted that they often asked "how" and "why" questions about weather and deep space objects.

The team also wanted people to recognize connections between STEAM and their everyday lives, highlighting what already exists in the community. When the "Ancestral Astronomy" hands-on activity was used, facilitators reflected that families would share stories about people in their lives. Notable examples include one child recognizing the *hojalata* (Mexican tin art) examples as something their *abuelo* (grandfather) had at his house, and people sharing memories of

observations of the night sky (e.g., shooting stars, moon phases). During team reflections, they shared that people in the co-creation group had "aha" moments as they recognized what they and their connections do as "STEAM," such as the chemicals used by house cleaners and car body work, or the physics involved in plumbing. Early in the project, the team noted that they had lots of conversations about how what they do connects to STEAM.

3.4 Albuquerque, NM

3.4.1 Project Overview

The lead partners in Albuquerque were at Explora Science Center & Children's Museum and Horizons Albuquerque. Explora is a science center located in Old Town Albuquerque that recently opened X Studio, a teen center and makerspace. Horizons Albuquerque provides academic enrichment programs for local youth, supporting students and their families. Goals for the project included engaging local youth perspectives on the future to develop relevant experiences related to Earth and space science. Together the project team provided opportunities for youth to develop and host Youth Summits that would shape ongoing programming, hands-on activities, or exhibitions related to Earth and space science. To further empower youth voices, the staff at Explora created a youth leadership position, called Youth Ambassadors on the Future, and worked with the Horizons Albuquerque staff to identify and invite youth to participate. These youth became project partners as they took on leadership roles in shaping and running Youth Summits, along with representatives from Talking Talon's Youth Climate Council. Additional partner organizations (such as Techqueria, FliSci, and Yucca) and individuals (such as Dr. Lillian K. Casias, Precialiano Narvaiz, and Natalie Gayoso) were involved as speakers, mentors, and more during specific program activities.

Early in the project, the Albuquerque team leveraged a long-standing series hosted by Horizons Albuquerque, called Super Saturday, that featured STEAM professionals as speakers and a listening session to gather community perspectives. Grouped by age-ranges, families engaged in activities that fostered conversation around their hopes, concerns, and ideas for the future. Using what they learned from listening sessions, the group hosted the Youth Summit on the Future. For this event, youth were invited to participate in full-day event designed to prompt them to share their thoughts and ideas about the future. Activities included speakers, peer-facilitated discussions, performances, and a business-oriented design challenge (Figure 11). Building on what they learned from these and related events, youth collaborated with local artists and makers in Explora's X Studio makerspace to design and build art installations for the museum. They also hosted a second event, the Youth Climate Summit, that was responsive to topics identified by participants at the Youth Summit on the Future. The team plans to continue to use the summit format to engage youth in topics that impact them, along with collaborating on events that address some of the topics that youth were interested in engaging with, such as equinoxes, solstices, and climate change. While some family and youth interests were outside the scope of this project, the Albuquerque team leveraged what they learned to secure additional funding to host similar events and apply what they learned in this project to new work.

Figure 11. Participants at the Youth Summit on the Future work together to imagine the future and brainstorm solutions for a business-oriented design challenge

3.4.2 Partnership

Explora and Horizons Albuquerque had worked together before this project, describing their partnership as a straightforward exchange, where one partner connected audiences to what the other partner was creating. Over the course of the project, they shared that they were able to deepen their relationship and work together in new ways and had identified ways to continue using each organization's strengths to do more work together. As a community-focused organization, Horizons Albuquerque has long-term relationships with families and youth in the community, while Explora can leverage the expertise of museum professionals to develop content or use their building as a place to gather, utilizing spaces like the X Studio makerspace. Together, they used these different strengths and worked together for planning and hosting events. Team members also shared that by using both organization's networks, they could select from a wider group of partners for involvement in specific events. Additional partners were brought in to provide speakers, content, mentorship, and other expertise.

The Albuquerque team shared that through working on the Co-creating with Communities project, they gained a more nuanced understanding of how co-creation partnerships can have varying entry points or levels of involvement. Early in the project, the team thought about co-creation primarily as the partnership between Explora and Horizons Albuquerque staff, as they approached their work in new ways. As the project developed, they started to think about different layers of co-creation, pointing out that Explora and Horizons Albuquerque were co-creation partners with each other, at the same time they were partners with the youth involved in event planning. Through this process, the youth shifted from being an audience to more involved partners in the project. Early in the project, youth and their families played the role of consultants to inform the directions site leaders would take in this project. As plans for the Youth Summits developed, youth were invited to be part of the planning committee, where they helped shape the overall experience and had opportunities to express themselves creatively (Figure 12). Overall, this project helped change the way the Albuquerque team thinks about how they approach working with youth.

Figure 12. Logo for the Youth Summit designed by Emile Ramirez, a Youth STEM Ambassador on the Future working with this project – the logo was screen printed on bags and t-shirts for the event by youth in the X Studio makerspace

By gathering community feedback and working with youth leaders, the Albuquerque team felt that they had greater confidence around planning engagement opportunities. As the project progressed, team members went from rough ideas to more concreate plans for possible directions for experiences based on what they heard from listening sessions and Summit activities. This included what content to focus on during the Summits and future efforts with the team referencing what they heard were concerns for the future previously shared by youth and their families. The team discussed how their engagement plans needed to change based on audience interests or concerns and resource availability. Using what they learned by listening to local family and youth voices, engagement experiences were designed to address climate and Earth science-related topics. In addition to following youth interests, the team has shared how the youth have been able to step into leadership roles, dispelling preconceived notions that youth were checked out or not engaged in the world around them. They also talked about how giving youth leadership opportunities often means leaning into a support role. By actively engaging youth, the Albuquerque team was more confident in their ability to engage audiences in relevant experiences.

3.4.3 Broad Audience Impacts

The Albuquerque team wanted youth to participate in experiences thinking about or planning for the future through engagement in topics they found interesting related to Earth and space science. Participation in the listening sessions and summits suggests that youth and their families found the topics engaging and relevant. At these events, youth and their families were able to share concerns for the future that were most relevant for them. With a focus of engaging youth in planning and designing experiences, the Albuquerque team was focused on youth developing leadership skills. While no evaluation data were collected from the Youth STEM Ambassadors, their contributions to the Youth Summit on the Future suggest that they had opportunities to practice these skills. These youth helped plan the event, design logos and materials, recruit participants, and facilitate the event.

Data collected at the Youth Climate Summit indicated that the event was relevant and supported their ability to participate in Earth science. Most participants (17 of 20) said that the Summit felt connected to their lives or experiences, explaining that learning about local impacts of climate change, hearing from people with varied backgrounds, and discussing actions that they can participate in led to these feelings of relevance. The three participants who did not say the event was connected to their lives indicated that they were interested in getting involved or learning more about the topics discussed. Almost all participants (16 of 17) felt that that the Summit helped them feel like someone who could participate in science. They often talked about the varied backgrounds and perspectives of the speakers, learning about ways to get involved in local actions, and learning about different approaches or solutions. One participant shared that they felt like someone who could participate in science because they were "exposed to so many people of different backgrounds. I now realize that there are many more things I could do, or be doing, to have an effect." Overall, the Summit supported youth perceptions that Earth science was relevant and a content area they could participate in.

3.5 Houston, TX

3.5.1 Project Overview

The Houston team brought together a children's museum and a community organization. The Children's Museum Houston is a large, community-focused children's museum serving families across the Greater Houston area through hands-on learning experiences with an emphasis on equitable, bilingual, and place-based outreach programming beyond the museum building. Community Family Centers is a longstanding nonprofit rooted in Houston's Greater East End that supports low-income families through bilingual education, afterschool programming, and wraparound services.

The Children's Museum Houston and Community Family Centers collaborated on community-engaged STEM initiatives in Houston, Texas, primarily centered in the Greater East End and Magnolia Park neighborhoods, including the Second Ward (*Segundo Barrio*) and nearby Pasadena areas. The Children's Museum Houston provided expertise in STEM public engagement design, event hosting, and evaluation, while Community Family Centers served as a trusted community anchor offering space, staff, and deep community connections. The communities served were predominantly Hispanic/Latine families, many of whom face historical and structural barriers to access culturally relevant STEM learning opportunities.

The overarching goals for this team were to deliver programming that was informed by community voices, and to continue developing culturally relevant and bilingual STEM experiences. Their work aligned with broader neighborhood priorities around environmental justice, green space development, and family centered learning, including the Houston team's expansion of a community green space. Emphasis was also placed on sustainability, not only in terms of environmental themes, but also ensuring that resources, relationships, and programming would continue beyond the initial project period.

Over the course of the project, partners conducted town halls and focus groups to identify community priorities and inform program design. These listening sessions shaped a series of family-centered STEM programs and events, including two-week summer camps at Community Family Centers that culminated in joint field trips and onsite museum-led activities; a *Día de los Niños* (Children's Day) science fair for young learners; and Lunch and Learn events that paired lunch distribution with hands-on STEM learning. Additional project activities included community garden planning, Sustainability Saturday programming focused on renewable energy and gardening, and staff trainings to build internal capacity at Community Family Centers.

Looking ahead, the Houston team plans to continue their partnership with a stronger focus on sustainability, environmental justice, and outdoor, action-oriented learning. Plans include community gardening, continued summer camps, and the development of a Green Team that cross-pollinates expertise among Community Family Centers, The Children's Museum Houston, and other partners. Regular place-based town halls and focus groups will remain central to ensuring that future programming continues to be grounded in community voice and priorities.

3.5.2 Partnership

The Houston team's partnership evolved from an initially museum-led model into a shared leadership and co-creation framework. Early in the collaboration, the Children's Museum Houston prioritized listening sessions and exploratory relationship-building to better understand community needs. Over time, this approach moved toward joint planning and co-delivery of programs, with both organizations contributing complementary strengths: the Children's Museum brought STEM content expertise and evaluation practices, while Community Family Centers provided cultural knowledge, trusted relationships, space, staffing, and ongoing insights into community dynamics. In practice, this meant that STEM activities were designed *with* community input rather than *for* the community. Programs reflected local culture, incorporated bilingual materials, and were embedded in familiar, accessible community spaces. Through this partnership, the team co-developed and delivered public engagement programs such as a Soil Testing program and Water Filtration engineering hands-on activity, Sustainability Saturday programs, Lunch and Learn STEM events, family STEM summer camps, and the Día de los Niños Science Fair, all designed to connect STEM learning to local environmental and community priorities.

Figure 13. Families in Houston wanted to learn more about testing pollution in their area. The team responded by developing locally relevant STEM experiences such as a soil testing public program.

This partnership fundamentally shifted how both organizations approached their work. For the Children's Museum, the collaboration served as a model for community-informed development, reinforcing the importance of ongoing feedback loops, cultural responsiveness, and leveraging partner expertise rather than assuming institutional authority. This work included exploring new engagement models outside of traditional formal learning settings and integrating frameworks such as Comunalidad into future projects. For Community Family Centers, the

strength of the partnership increased organizational confidence and capacity to expand programming. The formation of a dedicated STEAM team within Community Family Centers helped enable the organization to lead programming initiatives and maintain momentum beyond one-off events. Overall, the partnership fostered mutual growth, shared responsibility, and a deeper understanding of STEM into both organization's missions. Bilingual programming and the integration of cultural traditions, such as elder storytelling and gardening practices, made STEM learning feel relevant and approachable. Programs were intentionally designed for whole-family participation and created "third spaces" for youth – a space that is distinct from both school and home yet supportive of learning and exploration.

3.5.3 Broad Audience Impacts

The Houston team established goals for the broader public centered around science identity and the relevance of STEM to participants' personal lives and cultural identity. In terms of science identity, the team aimed for participants to see themselves as capable of doing science. The team also prioritized helping participants perceive STEM as relevant to their personal lives and cultural identity. In an open-ended response survey sent to families who participated in programming offered at Community Family Centers (n=17), caregivers reported increased excitement, confidence, curiosity, and future aspirations related to STEM both for themselves and their children. Quotes from caregivers highlighted children expressing new interests in engineering and aerospace careers, sharing STEM hands-on activities at home, and demonstrating enthusiasm after interacting with visiting partners and hands-on projects (0). All of the survey respondents noted that the events and programming provided by Community Family Centers and The Children's Museum Houston felt connected to their life or experiences. Everyday applicability of STEM was a recurring theme, with families noting how activities such as planting seeds, building solar powered projects, and participating in frequent workshops made science feel accessible and meaningful.

Over time, staff from Community Family Centers noted that they observed a shift from needing to convince families to participate to witnessing genuine excitement and ownership among community members. Families became more confident engaging with science content, and staff increasingly contextualized STEM topics within both local conditions and cultural knowledge systems. Collectively, data suggests that the programs developed successfully supported culturally relevant STEM engagement, strengthened science identity, and reinforced the relevance of STEM to participants' daily lives and cultural contexts.

Table 2. A sampling of quotes and themes from a survey emailed to Community Family Centers program attendees

Theme	Example Quotes
Science Identity (n=17)	• "It sparked many conversations and curiosity that they want to build on and visit and look more into. Even working conversations about future work." • "Opening our daughter's eyes to STEM has pushed her to be curious about engineering." • "My son wants to be an aerospace engineer." • "Hearing my son talking about what he learned during the career event… His excitement in his voice and willingness to learn."
Relevance (n=17)	• "Everyday activities that include steam activities that my child was able to share with us at home." • *"El de ciencias, plantamos pequeñas semillas en vasitos de papel."* (For the science project, we planted small seeds in paper cups.) • "This is a very effective program… we were amazed seeing our child working on making some science projects like toy engine car and solar powered crocodile." • "Frequently happened workshops with parents made us so excited about this program."

3.6 Brownsville, TX

3.6.1 Project Overview

The Children's Museum of Brownsville is a community-focused children's museum located in Brownsville, Texas, serving families across the Rio Grande Valley. The area consists of a large English/Spanish bilingual population, as well as a high proportion of low-income families. The Children's Museum of Brownsville worked with a diverse set of local and regional partners including: Reybotics, which developed and supported Virtual Reality (VR) and Alternate Reality (AR) STEM experiences for youth and teens; 9th Street Company, represented by Anthony McWilliams, which supported outreach, data collection, and exhibit development; and SpaceX, which collaborated with the Museum on exhibit development and volunteer engagement. Additional partners such as the local Housing Authority, public libraries, schools, Parks and Recreation, and a longstanding collaboration with a local flea market played important roles in expanding access and embedding the project within trusted community settings. These partnerships enabled the Museum to reach families with children, educators, and adult community members.

The Museum's goals were: 1) to increase access to STEM learning through mobile, low barrier experiences; 2) build trust with local families by maintaining a consistent and visible presence in familiar community venues; and 3) foster science identity by using AR and VR tools to make Earth and space science approachable and engaging. To advance these goals, the Museum and its partners implemented a range of outreach activities across both informal and formal

institutional settings. Flea markets served as a core outreach venue, offering frequent, short duration engagements that prioritized visibility, trust-building, and low-pressure participation. Activities included an AR planet exploration app and embedded surveys designed to capture community interests and feedback. Larger events, such as Space Fest and the Museum's 20th Birthday Bash, expanded the reach of the project through VR based science experiences, mobile planetariums, robotics, and engineering programming. Throughout these activities, bilingual facilitation and materials were consistently used to reduce barriers to participation. In the future, the Museum plans to integrate VR experiences more fully into in-house museum experiences and deepen their existing partnerships, as well as expand their Earth and space science programming.

The team employed a multi-method approach to gathering community feedback, centering on the principle of meeting families where they are. Embedded surveys were collected at flea markets, Space Fest, and other outreach events to capture community interests and needs. All feedback activities were conducted with bilingual facilitation, including Spanish/English signage and bilingual staff, to ensure accessibility across the community.

Figure 14. A Museum staff member collects feedback from local community members at an outreach event.

3.6.2 Partnership

Partnerships were developed with an emphasis on trust-building, mutual benefit, and long-term relationship development. In practice, this meant working closely with organizations already embedded in the community to meet families where they were and to ensure programming aligned with local interests and cultural contexts. These partnerships directly shaped how the work was implemented and expanded the Museum's capacity to serve diverse audiences. For example, the long-term flea market partnership became a primary mechanism for reaching families from across the region, including visitors who might not otherwise engage with the Museum. Collaboration with the Housing Authority facilitated access to underserved families, while partnerships with schools supported alignment between outreach activities and student learning interests. Over time, several partnerships evolved organically, with some partners initiating new ideas, such as SpaceX proposing an exhibition and employees offering to volunteer with the Museum. This evolution reflected growing trust, organizational learning, and

a shift toward co-creation, in which partners and the Museum jointly shaped programming that was culturally sustaining and culturally relevant.

The Museum's key strategy was to build trust through consistent physical presence in community spaces, particularly flea markets and neighborhood-based events. By showing up regularly and offering approachable, low barrier activities, staff became familiar faces trusted within the community, which helped reduce hesitation among families who may not initially have felt comfortable engaging with the Museum.

As staff gained experience facilitating interactive AR and VR activities, their confidence also grew in using these tools effectively to support learning and conversations. Staff reflected that repeated engagement improved not only their technical proficiency, but also their comfort navigating long-term relationships with community partners and audiences. Bilingual signage, facilitation, and scripts further supported inclusive engagement, while collaboration with community catalysts helped ensure that outreach strategies aligned with local needs. Overall, staff at the Museum strengthened their confidence in designing culturally relevant, community-centered STEM engagement experiences.

3.6.3 Broad Audience Impact

The team's primary goal was to meet the local community where they are and ground space science in fun, engaging activities that made science feel approachable rather than intimidating. Activities such as AR planet exploration, VR space simulations, and bilingual facilitation were designed to bring novel and approachable educational experiences to community members who may not otherwise have had these experiences if they don't normally visit the museum. Staff training and bilingual programming contributed to creating a welcoming environment.

The Children's Museum of Brownsville experimented with new ways of partnering and co-creating alongside their local community, leading to meaningful and community engaged work. Their consistent presence and partnership with their local flea market earned them a letter of support from this community partner, highlighting the impact the Museum's programming had with community members, as well as the strength of their long-standing partnership:

> "As owners of the local 77 Flea Market, we see firsthand how important it is to bring meaningful opportunities directly into the community. The Children's Museum of Brownsville did exactly that by bringing bilingual, engaging STEM experiences where they already feel comfortable and welcome… Children were excited to see themselves reflected in conversations about space exploration…"
>
> – Brownsville Flea Market Owner

Figure 15. The Brownsville team brought Earth and space science activities to their local flea market and asked families for feedback.

4. Discussion

As described in the case studies, each of the six sites had different partners and contexts which influenced the different kinds of meaningful Earth and space science public engagement work they implemented with their communities as a part of the Co-creating with Communities project. In order to understand the overarching outcomes for this project, the evaluation team looked across the six case studies to answer the summative evaluation questions, which included the following:

1. What kinds of partnerships are formed through project participation, and how have sites leveraged their partnerships to do work for this project?
2. How has participation in the project impacted sites' capacities or the work that they are doing together? Through the lenses of:
    a. Cultural relevance / culturally sustaining experiences that are embedded in local context
    b. Integration of STEM / STEAM content
    c. Co-creation or ways of partnering with others
    d. Personal growth (e.g. in leadership, understanding of STEM / STEAM)
    e. Organizational growth in leadership
3. How does engaging with project activities impact public participants':
    a. Sense of science identity;
    b. Interest / engagement in NASA (Earth / space) science content; and
    c. Perception of the relevance of STEM to their personal life?

The findings that cut across the six sites as well as supporting information for these findings are described in the sections below.

4.1 Partnership, intended impact, and sustainability

4.1.1 Most of the sites focused their work on having an impact on youth and families through partnerships between informal science organizations and two types of partners: local business leaders or local nonprofits that serve youth.

The partnerships formed through this project were between informal education organizations and community-based organizations, such as Children's Museum Houston and Community Family Centers, Explora and Horizons Albuquerque, Lawrence Hall of Science and Bay Area Community Resources, and Fleet Science Center and the San Ysidro STEM Committee. Many of the sites also worked directly with local business or community leaders throughout the project, such as Brownsville Children's Museum and 9th Street Company, and in Mesa, where the team partnered with RAIL CDC and many business leaders were involved in the co-creation group. While each site defined their goals in ways that were relevant to their community, most focused their work on having an impact on youth and their families, such as community events and summer camps hosted by the Houston team, afterschool activations in the Bay Area, large neighborhood or community festivals in Mesa, San Ysidro, and Brownsville, and a teen engagement events in Albuquerque.

4.1.2 Professionals at the six sites used what they learned in this project about community engagement as a model for other work at their organizations, including sustaining the work beyond the project grant period.

From the start of the project, a key concern shared across the sites was sustainability. How would sites end the project in a satisfying place for both project leaders and the communities they partnered with? How do the site leaders manage expectations about what parts of the

project can be sustained beyond the grant period? How could they be intentional in planning sustainability of their work?

Many of the sites found answers to these questions by connecting the community engagement model that they developed for their site to ongoing work. For example, the team in Albuquerque plans to continue to hold Youth Summits and use them as a model for teen engagement beyond the grant period. The team in San Diego worked to expand the number of organizations that felt a sense of shared ownership over the intergenerational STEM nights, for example in partnering with local Girl Scouts to host an event at the library. San Diego site leaders also presented the Comunalidad framework to their colleagues so that it could be used more broadly at Fleet Science Center. In Houston, the team connected their work to the organization's ongoing focus on literacy skills, which enhanced buy-in in the long-term. Moreover, Community Family Centers established a STEAM team that received professional development training from Children's Museum Houston educators, a relationship that will continue beyond the project. The team in Brownsville plans to continue engaging families at the local flea market. Finally, in the San Francisco Bay Area, staff at the Lawrence Hall of Science reported that this project has even changed how they are approaching future exhibit work as they work to involve local communities more in their development process. Early successes in implementing meaningfully community-engaged work led to the discovery of practices that sites hoped to replicate, through later phases of the project and beyond.

4.2 Professional and organizational impacts

4.2.1 Through the project, sites felt empowered to expand what counts as Earth and space science and add locally relevant content and art to STEM activities. The team meeting held in October 2024 in Mesa, AZ was a turning point for how sites thought about incorporating locally-relevant context into STEM activities.

As sites dove deeper into their work and heard directly from their communities, many began to expand their ideas around what counts as Earth and space science. Earth and space science was more than rockets and planets – it was pollution, local geology, past and present traditions in art, agriculture, architecture, and more. For several communities, the Earth and space sciences also represented a possible future career pathway for their children. Youth in Albuquerque convened multiple times around their vision for the future and how they could make an impact now. Mesa honored the ways that Earth and space sciences were already present in the community, in ways perhaps previously unrecognized. Several sites incorporated the arts, with Mesa and Albuquerque creating site-specific logos that accompanied their outreach work and murals or art installations that reflected incorporated Earth and space science related imagery.

At the October 2024 Mesa meeting, professionals across the six sites came together. Doña Maria Ávila Vera and Dr. Isabel Hawkins delivered a workshop focused on making visible the cultural roots of STEM. That is, the worldviews and systems of knowledge acquired through sustained relationships of a community with their environment over many generations (Hawkins & Ávila Vera, 2021). Drawing on everyday cultural practices, in this case corn growing and tortilla-making, they made explicit the science and the deep STEM knowledge in these cultural practices. Many professionals described this meeting as a transformative experience that supercharged how they approached developing their public engagement programs. For example, the San Francisco Bay Area team went on to develop a public engagement experience around ancient architecture and astronomy, and the San Diego team hosted intergenerational STEM nights that highlighted the intersection of Earth and space sciences with locally relevant content like food science.

4.2.2 All sites broadened participation by expanding who creates Earth and space science activities and who sees themselves as a STEM practitioner. They experimented with new ways of partnering and co-creating alongside their local community, leading to meaningful community-engaged work.

A few of the many examples of broadening participation in public engagement experience development from this project included the co-creation group in Mesa, Las Estrellitas-developed hands-on activities in the San Francisco Bay Area, and Albuquerque's Youth STEM Ambassadors for the Future. The project leadership did not strictly define co-creation for the site teams though examples were shared at early project team meetings. Instead, each site took the idea of co-creation and the spirit of Comunalidad to forge their own path forward to meaningful community-engaged work. In Mesa, members of the local co-creation group created an activity in the form of a tree to highlight the STEM roots of many local careers, highlighting how STEM is already present in the fabric of the community (see Figure 10). In Brownsville, staff experimented with new locations for outreach and engagement in the Earth and space sciences, including a local flea market. The flea market's owner noted their impact saying "…we see firsthand how important it is to bring meaningful opportunities directly into the community. The Children's Museum of Brownsville did exactly that by bringing bilingual, engaging STEM experiences where they already feel comfortable and welcome… Children were excited to see themselves reflected in conversations about space exploration…"

4.2.3 While the professionals at the sites were already comfortable with STEM engagement, the project increased their knowledge of Earth and space science within their local context. Many sites used the project to foster leadership beyond core partners.

Particularly among the informal education partners, there was an existing comfort in STEM outreach, with many staff on the projects working in education and outreach departments at their organizations. These professionals also often had existing knowledge that their strategies for engagement at the beginning of the project might not be as responsive as they could be to local contexts and were eager to infuse local contexts into their outreach strategies. The Houston team listened deeply to their community and created public engagement experiences that helped them to explore pollution in their area including through soil testing. The San Francisco Bay Area team leveraged the project as a chance to build the capacities of their afterschool educators, giving Las Estrellitas the skills to be able to make their own STEM hands-on activities based on the needs of their students.

Throughout the project many of the community-based organizations involved in the site teams grew in their comfort with hosting STEM outreach activities, at their locations or at locations within their broader community. This broadened public engagement development because it brought the experiences closer to the communities that the sites intended to serve and invited the public to contribute to or even co-create the programs and events. This in turn empowered members of the community to lead activities, beyond the site team leaders. For example, members of the Mesa co-creation group facilitated their engagement experiences at local festivals, and students in San Diego and San Francisco helped to facilitate hands-on activities at the events in their areas.

4.3 Broad Audience Impacts

4.3.1 Project activities had a positive impact on public participants' sense of science identity, interest or engagement in STEM, and perception of the relevance of STEM.

Beyond the professional impacts, all the site teams thought about the kinds of outcomes that they wanted for their public audiences as they were creating their public engagement experiences for this project. There were some similarities in these outcomes across multiple sites. For example, the San Francisco Bay Area, San Diego, and Mesa teams all wanted to impact participants' confidence in their ability to do or participate in STEM. These teams as well as Houston also wanted to impact participants' interest in STEM, Earth and space content, or STEM careers. Building on these interest goals, the San Diego and Albuquerque teams wanted to increase their participants' engagement in STEM or Earth and space science activities. Finally, the Mesa, Houston, and Brownsville teams all had goals related to helping participants see themselves reflected in STEM or understand where STEM is happening in their lives or neighborhoods. While there were similarities in the goals that the six sites had for participants, there were differences in the goals based on the teams' local contexts.

Because of the differences in goals, the sites all gathered information about public impacts in different ways. Despite these differences, data still indicate that project activities positively impacted participants' STEM identities, STEM interests, and understandings of STEM relevance.

Science Identity:

Evidence from multiple sites shows that using the project activities helped participants feel confident in their ability to participate in STEM. Over three-quarters of participants at San Diego's San Ysidro STEM Fair reported that the hands-on activities and information provided at the fair made them feel they can participate in science. People who participated in the Houston public engagement experiences said that they had increased confidence related to STEM. Finally, members of the San Francisco Bay Area team said that they observed the increased confidence in the Bay Area Community Resources students when they took over the facilitation of the STEM hands-on activities that they helped to create.

Not only was there evidence that participation in Co-creating with Communities impacted some individuals' confidence, but there was also evidence that it may have changed some of their behaviors related to STEM. For example, Houston participants said participating in the engagement experiences changed their future aspirations related to science for themselves or their children. Additionally, the San Francisco Bay Area team said that some of the students they were working with decided to participate in an engineering camp or other STEM programs because of their involvement in this project.

Perception of the Relevance of STEM:

There was also evidence from multiple sites that the project activities helped participants to make connections between STEM and their lives or experiences. For example, the San Francisco Bay Area team reflected that some Bay Area Community Resources students talked about connections between the project experiences and work they were doing at school. A Mesa participant talked about how the space medallions they were creating reminded them of the hojalatas (tin art) they had seen in their grandparent's house. The Houston participants talked about how the activities they participated in reminded them of everyday applications they were familiar with related to planting and solar power, and the youth at the Albuquerque Youth Summit talked about connections that they were able to make with the different speakers at the

event. Finally, the owners of the Brownsville flea market reflected on how they observed participants' excitement at seeing themselves reflected in the project activities.

Interest and Engagement in STEM and Earth & Space Science:

Finally, participants at multiple sites talked about how project activities sparked their interest in STEM or Earth and space topics. For example, at the San Ysidro STEM Fair, most participants said the San Diego hands-on activities made them want to learn more, and the drawing activity indicated that some of the topics they were interested in included the Earth, planets, and plants. A similar drawing activity implemented by the Mesa team showed an interest in learning about topics like planets, stars, and rocket ships. Houston participants talked about how the programs increased their excitement about STEM and their interest in engineering and aerospace careers.

Sites also indicated that they observed interest through participants' engagement in their project activities. For example, members of the Albuquerque team saw deep and prolonged engagement of the Youth STEM Ambassador team, leading to those youth developing aspects of the Youth Summit. San Francisco Bay Area team members observed the same families coming to multiple family engagement nights and intergenerational STEM nights. Lastly, members of the Mesa team observed long dwell times at their hands-on activities and even reported that a child sought out their booth during multiple engagement events.

5. Conclusion

5.1 Summary of Findings

Across the six sites, the Co-creating with Communities project advanced a shared commitment to co-creation while allowing each team to respond authentically to local contexts, priorities, and strengths. Taken together, the findings from this summative evaluation highlight how co-creation can function simultaneously as a partnership strategy, a capacity-building approach, and a pathway for broadening engagement with NASA-supported Earth and space science.

Overall, the project illustrates that there is no single model for effective community-engaged Earth and space science public engagement. Instead, meaningful impact emerged when sites were encouraged to adapt shared principles of co-creation to their local contexts, follow community priorities, and invest in relationships over time. By centering trust, cultural relevance, and shared leadership, Co-creating with Communities contributed practical insights for the informal science education field about how to cultivate more inclusive, responsive, and sustainable STEM engagement.

5.2 Contributions to NASA Science Activation Mid-Level Objectives

The portfolio of NASA Science Activation projects has a shared set of Mid-Level Objectives (MLOs) to guide programmatic and evaluation activities. In implementing Co-creating with Communities, project leadership was aiming to contribute to multiple NASA Science Activation MLOs:

- MLO 1a: Inspire participants' interest in STEM and the development of their identities as science learners.
- MLO 1b: Provide opportunities for participants to engage with the disciplinary content related to NASA science and engineering.
- MLO 3b: Increase the diversity of participants reached by Science Activation through intentional, inclusive programming.
- MLO 4a: Leverage Internal mechanisms to support sharing and learning across the Science Activation portfolio.

The first objective that the Co-Creating with Communities project focused on was to inspire participants' interest in STEM and the development of their identities as science learners (MLO 1a). As was described in the report, multiple sites supported the development of participants' STEM identities by helping them feel that they can participate in science or giving them confidence in their abilities. For some, this led them to participate in new STEM experiences such as camps that they may not have been interested in before. Additionally, data show that the project inspired participants' interest in STEM making them want to learn more about Earth and space science or engage in multiple STEM-related experiences.

The project contributed to MLO 1b by providing opportunities for participants to engage with disciplinary content related to NASA science and engineering. Through this project, the six sites gained skills in how to access and use NASA Science Mission Directorate (SMD) assets as a part of outreach activities. The project leadership supported teams by exposing them to existing NASA SMD activities which they were then able to build upon to create locally relevant offerings. By taking existing assets and finding local connections, the sites were able to meet participants where they were at through learning experiences that were authentic to the science and to each of the sites' local contexts.

By thinking deeply about the local contexts of the sites, Co-creating with Communities was able to support MLO 3b and increase the participants reached by Science Activation through

intentional programming. The public engagement experiences created by the six sites helped participants to make connections between STEM and their own lives and experiences. People were able to see how Earth and space science is relevant to them and should be something that they care about.

Finally, this work allowed the Co-creating with Communities project to leverage internal mechanisms to support sharing and learning across the Science Activation portfolio (MLO 4a). This work helped the professionals at the six sites to expand their perception of what NASA science could include. They moved beyond topics they were already comfortable with like robotics or space flight to also think about topics like Earth science. The project also helped them to think more about how to add locally relevant content in ways that they had not before.

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Appendix A: Professional audience instruments

This appendix includes instruments for team reflections, and represents the typical topics and prompts used to spark discussion and reflection. Due to variations in site-specific project focus and timelines, some reflection prompts may not have been used with every site or a site may have had additional prompts or conversations not represented here. Additionally, notetaking formats varied with sites either using Miro boards or Google Docs. This appendix provides the text prompts, with some representative examples from Miro.

All reflections included a summary of the previous reflection and a check-in about current project activities:

- What have you done for the project in the last month?
    - Event name(s), date, and summary
    - What went well?
    - What didn't go so well?
    - What is still challenging for us?
    - What did we learn?

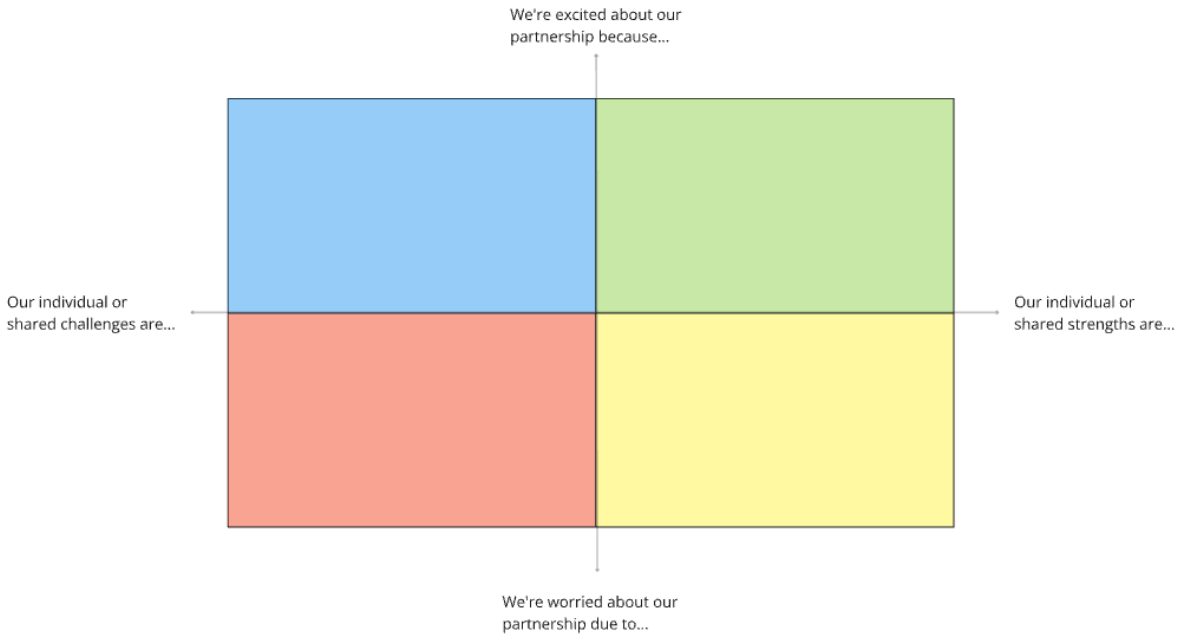
April 2024, site overview and initial reflection

- What should we know about the organization?
    - Museum partner(s)
    - Community partner(s)
    - Other partner(s)
- Project summary
- What should we know about your audience?
    - Who is your audience?
    - What are their needs?
    - What are their interests?
    - What else do you know about them?
    - How will this inform your final product?

May 2024, partnership reflections

- What are your goals for the partnership?
- What do you hope the partnership becomes?
- Activity using a matrix to identify strengths and challenges, see Figure 16.
    - We're excited about our partnership because…
    - We're worried about our partnership due to…
    - Out individual or shared strengths are…
    - Our individual or shared challenges are…

Figure 16. Strengths and weaknesses reflection matrix



June 2024, Rose, thorn, bud activity

- Roses: The things we've done well. Need to appreciate those!
  - What are you proud of?
  - What was unexpected?
  - What makes you excited?
- Thorns: The things which need to improve. We should change those.
  - Where are you struggling?
  - What issues do you need to work through?
  - What help do you need?
- Buds: The things which have potential. Let's discover!
  - What new perspectives or directions do you want to explore?
  - What do you want to develop/expand?
  - What are opportunities for learning in this project that excite you?

July 2024, evaluation check-in

- How are you collecting information from/about your community and their needs?
  - Methods (how)
  - Audience (who)
- How are you applying what you are learning?
  - Lessons and takeaways
  - Using data
- What help do you need to collect, interpret, or apply data?
  - What questions do you have for your audience?
  - What support or help do you need from us?

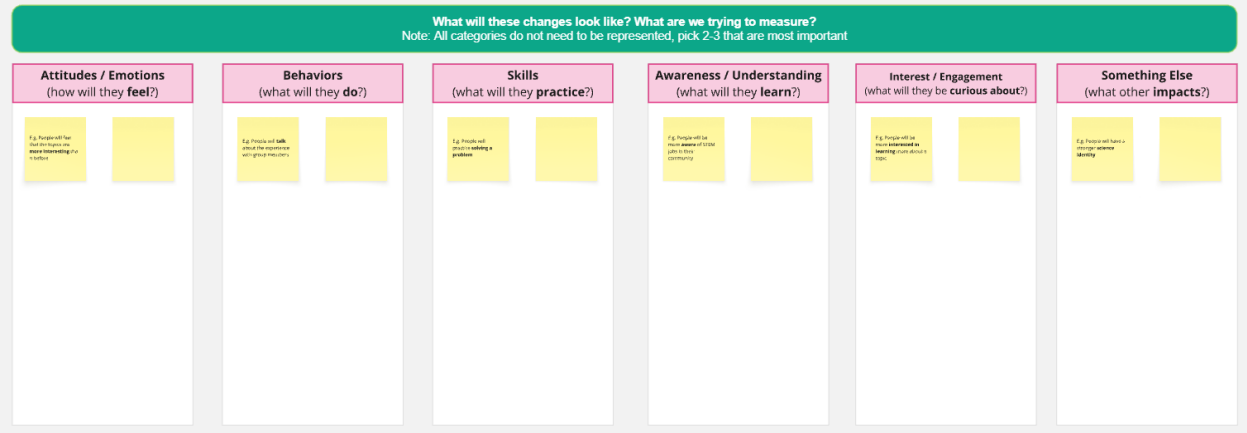
August 2024, open reflection

- Open reflection time to discuss the recent quarterly meeting

September 2024, identifying outcomes

- What impact or changes are you hoping to see with participants?
  - During the experience we hope people will…
  - Immediately after the experience we hope people will…
  - Long term, we hope people will…
- What will these changes look like? What are we trying to measure? (see Figure 17)
  Note: All categories do not need to be represented, pick 2-3 that are most important
  - Attitudes / Emotions (how will they feel?)
    - E.g. People will feel that the topics are more interesting than before
  - Behaviors (what will they do?)
    - E.g. People will talk about the experience with group members
  - Skills (what will they practice?)
    - E.g. People will practice solving a problem
  - Awareness / Understanding (what will they learn?)
    - E.g. People will be more aware of STEM jobs in their community
  - Interest / Engagement (what will they be curious about?)
    - E.g. People will be more interested in learning more about a topic
  - Something Else (what other impacts?)
    - E.g. People will have a stronger science identity

Figure 17. Activity categorizing potential outcomes



November 2024, reflecting on in-person gathering

- Reflecting on our time together in Mesa, and anything has happened since you got back home, what is on your mind?
- What do you want to focus your attention on in the coming months?
  - Culturally-sustaining (STEAM) practices
  - NASA Earth & Space Science
  - Intersections with your work/process thus far
- Support needed! We are continuing to grow as a community of practice…
  - Team-based inquiry planned for Jan -- other eval support needed before then?
  - Need help identifying NASA resources?
  - Other ways the larger group can support you?

February 2025, planning evaluator supported team-based inquiry (TBI)

Reflection time was used to guide the site teams through team-based inquiry, which was introduced at in-person and quarterly meetings prior to this month. Questions were drawn from templates included in the team-based-inquiry guide (Pattison et al, 2014).

- What activity / event / experience would benefit from formative evaluation through TBI?
- What are the goals of this experience?
- Prioritizing Inquiry Questions: Fill in the table below for each of the broad inquiry questions that you and your team have brainstormed. Based on how useful, actionable, and feasible each question is, determine whether it is a high, medium, or low priority for your team-based inquiry study.
    - Inquiry question
    - Why is this question important to your team?
    - What types of information would you need to answer this question (e.g., visitor comments, program observations)?
    - What resources would you need to answer this question (e.g., staff, time, expertise, data collection forms)?
    - What changes might you be able to make if you answered this question?
    - Based on all of this, how high of a priority is this question? H=High, M=Medium, L=Low
- Next Steps: Which question(s) will we focus on for TBI? What do we need to move into "Investigate"?

March 2025, evaluation planning

- What activity / event / experience would benefit from evaluation? What are the goals of this experience?
    - Existing consented evaluation data (formative)
    - Possible Summative Evaluation:

April 2025, summative evaluation planning

- Reviewed data collection protocol and prompts
- Summative evaluation planning
    - We are hoping to focus on answering this question through the summative evaluation:
        - How does engaging in project activities impact participants' a) sense of science identity; b) interest in NASA (earth/space) science content; and c) perception of the relevance of STEM to their personal life and cultural identity?
    - Are there any updates on upcoming events? Dates or logistics that we should know about?
    - Can you tell us about any other events where you are looking to collect summative data?
- These are the questions that you said you would prefer for the summative evaluation. Are these still the questions that you prefer?
    - A butcher block / writing / drawing activity
    - Flash interviews:
- We are created a guide and a data collection in English and Spanish for data collectors. Is there any other training or materials that would be helpful?

June 2025, public impacts reflections

- What impacts did you notice for participants?
    - a) sense of science identity,
    - b) interest / engagement in NASA (Earth / space) science content
    - c) perception of the relevance of STEM to their personal life and cultural identity

October 2025, connections to Earth and space content

- Earth & Space content
    - How have you thought about Earth and space assets in your activities or programming?
    - What Earth and space content or NASA assets have you used in your activities or programming? What influenced what Earth and space assets you did (or did not) use?
    - How did connecting with your communities impact what Earth and space assets you did or did not use?

Appendix B: Public audience instruments

This appendix includes the shared questions used for the public audience impacts, including the Spanish translations used by project teams. Site teams selected the prompts and methods most relevant to their specific goals. Each team was encouraged to pick two flash interview questions and one drawing activity prompt. Flash interviews were set up for English or Spanish data collection and had space for information about the data collection and group size, see Figure 18.

Figure 18. Formatted example for data collection

Co-Creating with Communities Interview - Houston

Date / Fecha: _____ Group/Groupo #: _____ Data Collector Initials / Iniciales del recopilador de datos: _____	Number of adults: _____ Number of children: _____

1. Was there anything from the event today that sparked your interest in science or you wanted to learn more about?

1. ¿Ha habido algo en el evento de hoy que haya despertado su interés por la ciencia/la ciencia de la tierra y el espacio o sobre lo que haya querido aprender más?

Check the appropriate box below and ask the matching follow-up question.
Marque la casilla apropiada y formule la pregunta de seguimiento correspondiente.

Yes/Sí [ ]	Can you give me an example? ¿Puede darme un ejemplo?	No [ ]	What would make this event more interesting for you? ¿Qué haría que esta actividad fuera más interesante para usted?

2. Did anything at the event today feel connected to your life or experiences?

2. ¿Ha habido algo en el evento de hoy que le haya hecho sentir conectado con su vida o sus experiencias?

Check the appropriate box below and ask the matching follow-up question.
Marque la casilla apropiada y formule la pregunta de seguimiento correspondiente.

Yes/Sí [ ]	Can you give me an example of what made you feel that way and why? ¿Puede darme un ejemplo de lo que le hizo sentir así y por qué?	No [ ]	What made you feel this way? ¿Qué le hizo sentirse así?

Flash interview

Protocol:

Ask these questions of adult participants, they can also report on their group's experience or group members like children could add a thought too. Write as close to verbatim notes as possible on participant responses.

- You can take notes during the discussion or after
- If you cannot write the summary down, then it is okay to make a voice memo but do not audio record the group
- Group size: number of adults, number of kids

Science identity:

- Did anything during the event today make you, or someone in your group, feel like someone who could participate in science [earth and space science]?
  Clarification if participants need more about what 'participate in science' means: learn about science, do science, talk about science
  - Yes – Can you give me an example of what made you feel that way and why?
  - No – What made you feel this way?

- ¿Ha habido algo durante la actividad de hoy que le haya hecho sentirse, a usted o a alguien de su grupo, como alguien que puede participar en la ciencia/ciencia de la tierra y el espacio?
  Aclaración si los participantes necesitan más información sobre lo que significa «participar en la ciencia»: aprender sobre ciencia, hacer ciencia, hablar de ciencia
  - Sí - ¿Puede darme un ejemplo de lo que le hizo sentir así y por qué?
  - No - ¿Qué le hizo sentirse así?

Science interest:

- Was there anything from the event today that sparked your interest [in science/in earth and space science] or you wanted to learn more about?
  - Yes – Can you give me an example?
  - No – What would make this event more interesting for you?

- ¿Ha habido algo en el evento de hoy que haya despertado su interés por la ciencia/la ciencia de la tierra y el espacio o sobre lo que haya querido aprender más?
  - Sí - ¿Puede darme un ejemplo?
    No - ¿Qué haría que esta actividad fuera más interesante para usted?

Science enjoyment / engagement:

- Was the event today fun for you and your group?
  - Yes – Can you give me an example? What made it enjoyable?
  - No – What would make the event more enjoyable for your group?
- ¿Le ha parecido divertido el evento de hoy a usted y a su grupo?
  - Sí - ¿Puede darme un ejemplo? ¿Qué lo ha hecho divertido?
  - No - ¿Qué haría que este evento fuera más divertido para su grupo?

STEAM relevance:

- Did anything at the event today feel connected to your life or experiences?
    - Yes -- Can you give me an example of what made you feel that way and why?
    - No – What made you feel this way?
- *Probe when specific cultural connections are expected [as identified by site]: It participant mentions cultural connection but doesn't give a clear example; could you tell more about [expected cultural connection]*

- ¿Ha habido algo en el evento de hoy que le haya hecho sentir conectado con su vida o sus experiencias?
    - Sí - ¿Puede darme un ejemplo de lo que le hizo sentir así y por qué?
    - No - ¿Qué le hizo sentirse así?
- *Si el participante menciona una conexión cultural pero no da un ejemplo claro, ¿podría explicar mejor a qué se refiere con _____?*

Drawing activity prompt

Participant instructions:

- Share your ideas! Draw or write your answer to the question below.
- ¡Comparta sus ideas! Dibuje o escriba su respuesta a la siguiente pregunta.

Prompts

- Something interesting I learned today about Earth and space science is…
- Algo interesante que he aprendido hoy sobre las ciencias de la Tierra y del espacio es…

- When I think about Earth & Space science, I am curious to learn more about…
- Cuando pienso en las ciencias de la Tierra y del espacio, siento curiosidad por saber más sobre…

- Because of the event today, I am curious to learn more about…
- Gracias al evento de hoy, tengo curiosidad por saber más sobre…

- After the event today, what questions do you have about Earth and space science? /
- Después del evento de hoy, ¿qué preguntas tiene sobre las ciencias de la Tierra y del espacio?

- At the event today, I had fun doing…
- En el evento de hoy, me he divertido haciendo…