

Final Report for

From our Town to Outer Space: Bringing NASA Science and Engineering to Underserved Communities through a National Public Library Exhibition Program

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The material in this report is based upon work supported by NASA under award No. NNX15AB02G, entitled "From our Town to Outer Space: Bringing NASA Science and Engineering to Underserved Communities through a National Public Library Exhibition Program", or, FOTOS.

Accomplishments:

Goals for this program were:

Goal 1. Increase youth and adult patrons' interest in and engagement with NASA's missions, contributions to STEM disciplines, and STEM careers.

Goal 2. Build the capacity of public libraries nationwide to deliver inspirational and effective STEM learning experiences for their communities.

Goal 3. Create innovative collaborations between project team members, NASA mission partners, and public libraries, to provide sustained STEM programming for both youth and adults.

Goal 4. Advance our understanding of effectively reaching underserved and underrepresented library populations in rural and urban communities.

Goal 5. Disseminate project resources and evaluation findings to NASA and ISE communities.

Major accomplishments in this program included completed a successful 9 venue tour, plus an additional extended tour to one library and one museum host venue site. The museum site features *Discover NASA* as a museum-opening exhibition. All host venue sites received in-person training in exhibit setup, NASA concepts, and hands-on activities at the shakedown site at the Louisville Public Library in Colorado. The exhibit tour was able to bring this exhibition to library venues of a variety of sizes and populations, focusing on rural regions, and regions with large underserved populations. Many of the sites were able to work with the Solar System Ambassadors, Night Sky Network, and NASA Centers. Results from the project Summative Evaluation (attached) showed that this experience was largely positive for the venues, and their patrons.

Comments from host sites:

- *There is so much that was valuable. It was an exciting, hands-on exhibit. It was attractive to toddlers and adults. Families had a wonderful time, they loved doing the green screen together. We made many of the programs family programs when we saw the interactions. This was probably the most interactive of the three exhibits we have hosted. That element was terrific. Sometimes people understand concepts through their hands, through doing the task.*
- *Our partnership with NASA Langley came about because of Discover NASA. We had been endeavoring to build contacts there off and on, but it wasn't until we got the Discover NASA exhibit that we had any real luck. Now we are excited to potentially provide event space and/or advertising space for their 2017 Centennial programs, and look forward to working with them even further in the future!*
- *It was a great opportunity for us to expand our own knowledge and materials on STEM-related topics. It provided us with an opportunity to serve new individuals and share information with patrons that hadn't been as active at the library. It was a unifying experience for our community and easy to get people excited about the exhibit and additional programming. There was so much to explore with the exhibit that it made it easy to hit different areas of interest with additional activities.*

Patrons also provided important feedback on the exhibit, but our librarians at Winfield told us that one third grader's face and reaction really encapsulated what the exhibit meant to their community, what he wrote on his card was simply: "Mind. Blown."

Dissemination of Results

The attached Evaluation Report was disseminated through the National Center for Interactive Learning website, as well as informallearning.org. Project results were also disseminated at the Association of Science-Technology Centers annual conference during all project years.



From Our Town to Outer Space (FOTOS): Bringing NASA science and engineering to underserved communities through a national public library exhibition program – Final Evaluation Report

Submitted to Paul Dusenbery and Anne Holland of the National Center for Interactive Learning at the Space Science Institute, March 2018

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Executive Summary

I have been involved in working with exhibits and programs for nearly 25 years and this was the best exhibit we have ever had. It was so very well curated, easy to assemble, and the support from your team was excellent. I believe it is vitally important for people in rural communities to have these experiences. It offers everyone the opportunity to grow a deeper understanding of concepts and activities that they are not often exposed to.

FOTOS Host Library Staff Member

In 2014 the National Aeronautics and Space Administration (NASA) awarded a *Competitive Program for Science Museums, Planetariums and NASA Visitor Centers Plus Other Opportunities* grant to Space Science Institute's (SSI) National Center for Interactive Learning (NCIL) called *From Our Town to Outer Space (FOTOS)*. The three-year grant brought STEM¹ learning experiences around NASA disciplines to six public libraries through a traveling exhibit called *Discover NASA*, associated programming for library patrons, training, resources, and a virtual community of practice for library staff and others who were interested in bringing STEM programming to libraries. The project had a special focus on delivering NASA content and programming to underserved and underrepresented communities across the United States. FOTOS is a *STAR* Library Network (*STAR Net*) program (www.starnetlibraries.org).

Education Development Center conducted the summative evaluation of the *FOTOS* project, investigating the implementation of the project and its impact on library staff and patrons. Methods included pre- and post-exhibit surveys administered to staff from each library that hosted the exhibit; interviews with staff from host libraries; patron surveys; and site visits to two *Discover NASA* host libraries to observe and interview patrons and library staff.

Youth and adult patrons' understanding of NASA's missions, contributions to STEM disciplines, and STEM careers increased at host libraries.

The majority of participating library staff and patrons were enthusiastic about the *Discover NASA* exhibit and all host libraries viewed the exhibit as a success for their library. Youth and adult library patrons at *FOTOS* host libraries became more interested in, and engaged in, the NASA/STEM topics presented in the *Discover NASA* exhibit and related programming. Exhibition attendance was considered high by library staff and at some libraries, actually increased their overall library attendance and/or new patron registrations. The libraries (4 of 6) reporting circulation statistics for *Discover NASA* related materials showed increases in ranging from 17% to 182%. All host libraries offered programming associated with the *Discover NASA* exhibit topics and several offered tours of the exhibit, field trips for local schools, and other special events outside regular library hours such as a star gazing parties and "special movie nights."

¹ STEM stands for science, technology, engineering, and mathematics.

Host libraries increased their capacity to deliver STEM learning experiences for their communities.

Host library staff received training via an in-person workshop, webinars, SSI developed programming and resources, and access to the *STAR Net* Community of Practice. In addition, SSI/NCIL staff provided individual support as needed via email, on online platform, and phone. All host libraries (100%) developed and conducted exhibit-related programs, used SSI programming, and collaborated with outside partner organizations for additional program development and implementation. Library staff reported an increase in their knowledge of *Discover NASA* exhibit-related topics and felt prepared to host the *Discover NASA* exhibit as a result of *FOTOS* training and support.

***FOTOS* library staff members increased their knowledge, interest, and confidence about STEM-based library programming.**

Library staff knowledge, interest, and confidence about STEM-based library programming increased based on their experience with the *Discover NASA* exhibit according to retrospective Before and Now (after) Post-survey responses. Library staff saw encouraging STEM learning as a role for their library.

Library staff developed partnerships to provide STEM programming for youth and adults at all *FOTOS* libraries.

Libraries worked with NASA resources, people and/or programs to coordinate and implement *Discover NASA* related programming at the host libraries. Some *FOTOS* libraries created new partnerships that have gone beyond the timeframe of the exhibit. Partners included science centers/museums, universities and colleges, retired teachers/STEM professionals, astronomy societies, and NASA-affiliated groups/individuals. The *FOTOS* project met its goal of creating innovative collaborations between project team members, NASA mission partners, and public libraries to provide sustained STEM programming for both youth and adults at *FOTOS* host libraries.

***FOTOS* host libraries advanced their understanding of effectively reaching underserved and underrepresented library populations in rural and urban communities.**

Prior to the *FOTOS* project most host libraries had little access to STEM programming. The project provided training, programming/activities, and resources for libraries to use or develop their own programming and then implement it in their libraries.

The *Discover NASA* exhibit and programming in host libraries was effective in reaching underserved library populations. *FOTOS* host libraries identified audiences historically underrepresented in STEM fields in their communities and then successfully provided STEM learning experiences that included attendees from those targeted audiences. In addition, all *FOTOS* libraries were successful in attracting participation representative of their communities' demographics overall.

Introduction and Project Description

The Discover NASA project gave me more tools to implement quality STEM programs at our library. It gave me a reason to partner with other community resources to bring quality programs to the library. It also helped to partner with schools and other educational entities - I had a very specific, high quality, interesting educational program to offer them.

FOTOS Host Library Staff Member

In 2014 the National Aeronautics and Space Administration (NASA) awarded a *Competitive Program for Science Museums, Planetariums and NASA Visitor Centers Plus Other Opportunities (CP4SMP+)* grant (NASA - NNX14AQ77A) to Space Science Institute's (SSI) National Center for Interactive Learning (NCIL) called *From Our Town to Outer Space (FOTOS)*. The three-year CP4SMP+ grant brought STEM learning experiences around NASA disciplines to six public libraries through a traveling exhibit called *Discover NASA*, associated programming for library patrons, and training and a virtual community of practice for library staff and others who were interested in bringing STEM programming to libraries. The project had a special focus on delivering NASA content and programming to underserved and underrepresented communities across the United States.

The *FOTOS* project shared NASA content with the project's audiences via the *Discover NASA* hands-on library exhibit and tour, the development and dissemination of inquiry-based STEM activities/programming for different age groups, and library staff training (online and in-person) that introduced them to the NASA/STEM content in the exhibit and guided them in developing complementary programming. Further support for library staff came directly from interactions with NCIL employees and an established a community of practice (CoP) called Science-Technology-Activities and Resources Library Network (*STAR Net*)² for both librarians and STEM professionals. The project also developed resources for the CoP and invited NASA mission staff to participate as active members. A series of webinars (approximately 2 per year) on relevant topics to CoP members were offered throughout the project. Information about the *STAR Net* program is on www.starnetlibraries.org.

Libraries applied to be a part of *FOTOS* and six were chosen to host the 750 square foot *Discover NASA* exhibit for a two/three-month period at each library, receive related programming, training, support, and resources including an in-person workshop, access to the *STAR Net* CoP, and an online platform (iMeet Central) for communication with SSI and other *STAR Net* libraries. The STEM content covered in the exhibit included human exploration, NASA Science Missions, engineering, comparative geology, sun-earth connections, and aeronautics with the intention of sharing the breadth of NASA activities, and the changes NASA has sparked in the daily lives of patrons. NCIL utilized NASA subject matter experts as well as existing *NASA Wavelength* resources, and images for content development.

The *Discover NASA* exhibit included computer interactives, interactive panels, multimedia experiences, standard graphical panels, and a hands-on Discovery Table. Examples of features in the exhibit included an immersive experience with astronauts living on-board the International Space Station, a touch table interactive where users could build their own solar systems, a Wind Tunnel interactive activity, a "Discover NASA Quiz Show" where patrons could test their NASA knowledge, a JPL/NASA produced "Eyes on Exoplanets" touchscreen kiosk that allowed patrons to learn about the search for exoplanets and the latest discoveries with near-real-time updates, and a "Mission to Mars" kiosk that took patrons

² The *STAR Net* CoP is part of NCIL's NSF- and NASA-funded *STAR* Library Network.

on a journey to Mars and back. In addition, asteroids and comets were featured in the “Space Rocks” kiosk that included games such as “What if it Hit My Town”, “Asteroid Impact,” and “What are the Odds?” Two large meteorite samples were available for patrons to explore using a magnifying glass and bar magnet. Other interactives included a “Daily Planetary Report Station” where patrons used a green screen and costumes to give a weather report from various locations in the Solar System, and a “Discovery Table” that featured various space-themed, hands-on activities such as designing and building robotic rovers using Legos and other equipment.

The project conducted a two-day orientation, training, and program planning workshop at the Louisville Public Library in Colorado on November 17th and 18th, 2015 for the *FOTOS* Project Director and Project Coordinator from each host library. Workshop topics included hands-on science activities, programming and outreach consultation, professional development resources, including the *STAR Net* CoP, set up and take down of the *Discover NASA* exhibit, and an opportunity to ask questions and network with colleagues.

The *FOTOS* project had five goals.

Goal 1. *Increase youth and adult patrons’ interest and understanding of NASA’s missions, contributions to STEM disciplines, and STEM careers*

Goal 2. *Build the capacity of public libraries nationwide to deliver inspirational and effective STEM learning experiences for their communities.*

Goal 3. *Create innovative collaborations between project team members, NASA mission partners, and public libraries, to provide sustained STEM programming for both youth and adults.*

Goal 4. *Advance our understanding of effectively reaching underserved and underrepresented library populations in rural and urban communities.*

Goal 5. *Disseminate project resources and evaluation findings.*

This report summarizes evaluation findings from all years of the *FOTOS* project (2014 - 2017) and focuses on the impact of the exhibit, programming, and accompanying project activities on patrons and library staff.

Evaluation Methodology

The summative evaluation of the *FOTOS* project was conducted by Educational Development Center (EDC) and employed a mixed-methods design based on the *STAR Net* Project (National Science Foundation # 1010844) evaluation plan. The evaluation investigated the implementation of the project, progress toward achieving Goals 1-4, and more specifically, the impact on library staff and patrons from participating libraries. The evaluation methods included administration of pre- and post-exhibit surveys to library staff who hosted the exhibit, site visits to two selected libraries, and conducted interviews with staff from all the host libraries, conducted interviews and collected patron surveys, and reviewed final reports from host libraries. Institutional Review Board approval was received for the evaluation plan and instruments before data collection began.

Evaluation Questions

The evaluator worked with the *FOTOS* team to develop a project logic model (see Appendix A) that was used to create a matrix of goals, outcomes, indicators, and guiding evaluation questions (see Appendix B). The evaluation was guided by the following questions:

1. *To what extent do youth and adult library patrons at FOTOS host libraries become more interested in, and engaged in the NASA/STEM topics presented in the exhibit and related programming?*
2. *Does the professional development delivered by FOTOS help host librarians deliver informal STEM programming?*
3. *To what extent do FOTOS team members, library staff, and NASA mission partners develop partnerships to provide STEM programming for youth and adults? To what extent do libraries work with NASA resources, people and/or programs?*
4. *Is the FOTOS exhibit and programming effective in reaching underserved library populations?*
5. *To what extent does FOTOS succeed in reaching the targeted library participants at the host libraries?*

Table 1 shows an overview of the data collection instruments and when they were administered. A detailed description of the evaluation methodology that includes a matrix of data collection methods, response rates, and evaluation instruments can be found in Appendix C.

Table 1: FOTOS Evaluation Instruments and Timeline for Administration

Instrument	When Administered/<i>Who Administered</i>
<i>Discover NASA</i> Training Satisfaction Surveys	November 2015, <i>EDC</i>
Library Staff Pre-Exhibit Survey	October – November 2015, <i>EDC</i>
Library Staff Six Month Post-Exhibit Survey	Six months after <i>Discover NASA</i> exhibit left each library, <i>EDC</i>
Interviews with <i>Discover NASA</i> project directors and coordinators	After <i>Discover NASA</i> exhibit left each library (or at the site visit – in person), <i>EDC</i>
Library Patron Survey (Exhibit and/or programming)	While <i>Discover NASA</i> exhibit was at each library, <i>Library staff administered</i>
Site visits to two libraries to observe patrons interact with the <i>Discover NASA</i> exhibit, interview library patrons, interview library staff, and observe library staff conduct exhibit programming (identity of libraries confidential)	Library #1: June 2016, <i>EDC</i> Library #2: June 2017, <i>EDC</i>
Final Report Form	Immediately after <i>Discover NASA</i> exhibit left each library, <i>NCIL</i>
Exhibit-related circulation records	As part of the final report form collected by <i>NCIL</i>

Evaluation Findings

Encouraging STEM learning has always been a goal of the library, but seeing the response to the exhibit has only increased our desire to emphasize STEM in as much of our programming and activities as possible.

FOTOS Host Library Staff Member

Evaluation findings are organized around the evaluation question(s) related to each goal. Results from all relevant data sources are presented together.

Goal One. *Increase youth and adult patrons' interest and understanding of NASA's missions, contributions to STEM disciplines, and STEM careers*

To what extent do youth and adult library patrons at FOTOS host libraries become more interested in, and engaged in the NASA/STEM topics presented in the *Discover NASA* exhibit and related programming?

In addition to site visit observations; patron interviews; library staff interviews and surveys; and final reports where library staff indicated high patron attendance, engagement, and interest, 573 library patrons completed a patron survey after interacting with the *Discover NASA* exhibit and/or participating in related programming. Library staff and the majority of patrons indicated that they found the exhibit and related programming to be engaging and interesting. See Appendix D for patron survey results. In addition, host libraries that calculated circulation for FOTOS-related materials showed increased circulation, a possible indicator of increased patron interest in NASA/STEM topics.

Goal 1 - OUTCOMES:

- 1) Youth and adult library patrons at host libraries find the exhibits and related programming engaging
- 2) Library youth and adult patrons at host libraries become more interested in NASA Missions and STEM careers

Patrons spent time engaging with the *Discover NASA* exhibit and programming.

- ✓ A total of more than 74,000 patrons visited the *Discover NASA* exhibit (5 of 6 libraries reported using head count, gate count, and attendance to determine their estimate – one library did not submit a final count)
- ✓ Host libraries reported that 7,939 patrons attended 217 programs associated with the *Discover NASA* exhibit (5 of 6 libraries reporting)
- ✓ At least three libraries offered exhibit tours and reported approximately 3,600 patrons/community members attended the tours
- ✓ The length of patron visits to the exhibit ranged between 0 to 840 minutes with 79% of patrons (381/480) reporting they spent 16 – 60 minutes interacting with the exhibit
- ✓ Host library staff members commented on patrons engaging with the exhibit:
 - “[*Discover NASA*] opened doors to a lot of different people that have not been in before. It broadened our customer base. We had a slight uptick in new registrations last month.”

- “I saw and talked to several people that made great connections between younger and older family members such as children and their grandparents. That was an added bonus.”
- “My favorite thing was seeing young people getting excited over the Quiz Game (adults too)! We also had a volunteer who stood up after our training and said, ‘I have been to a lot of exhibits and this is the best I have ever seen!’ and that was fantastic to hear!”
- “The exhibit enhanced the library experience for our regular, new, and out of town patrons in a fun, inspirational, and educational way. It also showed the public (and even some within our own library admin) how dynamic libraries can be. This was reflected in the verbal and written feedback from the patrons, and in the way patrons, staff, and partners still come in and talk about the exhibit.”
- “We continue to hear from the community about the exhibit and the supporting programs. They want to know what is next! In addition, science related programs continue to be popular with both children and adults, and we are still offering Ad Astra, our after-school workshop that explores science. -- Thanks so much for the opportunity!”

Patron survey results indicate high levels of patron engagement and interest in *Discover NASA* topics.

- ✓ 89% (501/564) of patrons agreed or strongly agreed they would recommend the *Discover NASA* exhibit to others
- ✓ 88% (497/562) of patrons agreed or strongly agreed the *Discover NASA* exhibit was a valuable addition to the library
- ✓ 83% (467/562) of patrons agreed or strongly agreed they increased their knowledge about NASA missions, impacts, and space science as a result of visiting the exhibit and/or attending a *Discover NASA* associated program
- ✓ 86% (308/358) of adult patrons attending with children indicated the children were very interested in the exhibit and/or programming, and 89% (317/356) indicated that the children learned something they did not know before they attended the exhibit or programming

Patrons indicated they were interested and planned to learn more about NASA missions, impacts, and space science.

- ✓ 79% (440/560) of patrons responding to the Patron survey agreed or strongly agreed the *Discover NASA* exhibit increased their interest in learning more about NASA missions, impacts, and space science
- ✓ 70% (393/560) of patrons responding to the Patron survey agreed or strongly agreed they planned to learn more about NASA missions, impacts, and space science using library resources such as looking for books or videos
- ✓ Recurring themes found in patron interview results included the following ideas:
 - Patrons visited the exhibit/library multiple times while the exhibit was on display. “We come to the library all the time now.”
 - The exhibit was well-received by patrons. “I like it a lot. We LOVE it!”
 - Patrons indicated they were interested and may want to learn more. “We like learning about space stuff!”
- ✓ The four libraries reporting circulation statistics for *Discover NASA* related materials showed increases ranging from 17% to 182% (Discover NASA Dewey Call numbers: 520 – 528, 629.44, 629.45, 387 were used to determine circulation)
- ✓ 50% (3/6) of the host libraries reported that they acquired additional exhibit-related resources in the six months since the *Discover NASA* exhibit left their library

People did not realize they were spending so much time at the exhibit –one patron said they had spent 20 minutes, but was actually 1.5 hours. That is a testament to quality and interactivity of exhibit.

Library Staff Member

Conclusion: Youth and adult library patrons at *FOTOS* host libraries became more interested in, and engaged in, the NASA/STEM topics presented in the *Discover NASA* exhibit and related programming. The project goal of increasing youth and adult patrons' *interest* and understanding of NASA's missions, contributions to STEM disciplines, and STEM careers was met at *FOTOS* libraries. Library patrons (88% surveyed) agreed or strongly agreed that the *Discover NASA* exhibit was a valuable addition to their library and many adult patrons (79%) indicated they became more interested in learning more about in the *Discover NASA*

topics presented in the exhibit and associated programming. Adults (86%) also reported that youth with them were very interested in the exhibit and/or programming, and 89% indicated the youth learned something new. Exhibition attendance was considered high by library staff and at least two libraries actually increased their overall library attendance and/or new patron registrations. All host libraries (6/6) offered programming associated with the *Discover NASA* exhibit topics, and several offered tours of the exhibit, field trips for local schools, and other special events outside regular library hours such as star gazing parties and "special movie nights."

Goal Two. *Build the capacity of public libraries nationwide to deliver inspirational and effective STEM learning experiences for their communities.*

Evaluation Question: Does the professional development/resources/support delivered by *FOTOS* help host librarians deliver informal STEM programming?

The *FOTOS* project provided support and professional develop in order to build the capacity of *FOTOS* libraries to host the *Discover NASA* exhibit and deliver STEM learning experiences. An in-person workshop was offered to the Project Director and Project Coordinator from each host library and webinars on a variety of topics related to the exhibit were offered throughout the project. The *STAR Net* CoP was also made available to host library staff, and exhibit and programming support was offered via email, telephone, and an online communication platform (iMeet Central) that all host libraries were part of. On the Pre-survey, 47% of library staff indicated they had received some kind of training before *FOTOS* specifically on STEM activities and programs for library patrons, 37% had not and 16% were not sure.

Goal 2 - OUTCOMES:

- 1) Host librarians/staff improve their knowledge about NASA/STEM topics presented in the exhibit
- 2) Host librarians/staff are more interested in, knowledgeable about, and confident about how to develop and deliver STEM-based library programming

All host libraries developed and conducted exhibit-related programs and collaborated with outside partner organizations for program development and implementation.

- ✓ During the exhibit, host libraries offered 217 exhibit-associated programs and 148 more programs in the six months since hosting the exhibit (total 365 programs)
- ✓ Host libraries implemented 23 *Discover NASA* programming activities that were provided by SSI and 194 other programs (one library did not report and another included tours and fieldtrips in their programming count)
- ✓ Five of six host libraries are planning to host exhibit-related activities/programs in the future
- ✓ Topics such the 2017 eclipse, a variety of STEM programming, space-related programs, “Space Fest,” and “International Observe the Moon nights” were listed for potential future programming by host libraries

A FOTOS in-person workshop held on November 17-18, 2015 helped library staff feel prepared to deliver informal STEM programming (see Appendix E for Workshop survey results).

- ✓ 100% (12/12) of workshop participants agreed or strongly agreed the workshop helped them feel prepared to facilitate exhibit-related learning experiences with their community
- ✓ 100% (12/12) agreed or strongly agreed they felt comfortable facilitating *Discover NASA* programming in their library
- ✓ 92% (11/12) agreed or strongly agreed they were comfortable integrating *STAR Net* programming resources into *Discover NASA* programs at their library

Library staff reported an increase in their knowledge of *Discover NASA* exhibit-related topics.

- ✓ The increase in knowledge about NASA’s broad mission, the solar system and beyond, the International Space Station, and aeronautics had statistically significant increases – see Table below. (Pre and Post-survey comparison)
- ✓ Increases in knowledge about NASA’s broad mission and aeronautics had the greatest increases in percent of change (48% and 36% respectively) – the lowest increase in percent of change was for Mars exploration and technology for now and the future (16% each)

Table 2: Library Staff Levels of Knowledge about *Discover NASA* Exhibit Topics

1 = Beginner and 5 = Expert (n=14, matched pre-post responses only)

	Pre Mean	Post Mean	Percent of Change	Difference in Means (Pre to Post)	Significant Difference*
NASA’s broad mission	2.36	3.50	48%	+ 1.14	Yes (p=.002)
Earth science – our changing planet	2.57	3.00	17%	+ 0.43	No
The solar system and beyond	2.50	3.14	26%	+ 0.64	Yes (p=.033)
Human exploration – the International Space Station/astronauts	2.57	3.36	31%	+ 0.79	Yes (p=.015)
Aeronautics for now and the future	2.21	3.00	36%	+ 0.79	Yes (p=.028)
Mars exploration	2.71	3.14	16%	+ 0.43	No
Technology for now and the future	3.14	3.64	16%	+ 0.50	No

* Based on a matched-pair t-test (df=13)

Library staff indicated they understood the NASA/space science concepts and were capable of facilitating their own or other’s programs related to those concepts.

- ✓ Library staff showed a statistically significant increase in their capability to generate new ideas for NASA/space science programs for their library -- *Based on a matched-pair t-test (p=.019) n=14, matched Pre – Post-survey results*

- ✓ 57% (8/14) agreed or strongly agreed they were confident they could implement their own ideas for NASA/space science programs at their library – matched post survey responses, a 12% increase from Pre-survey results
- ✓ 33% (6/14) agreed or strongly agreed they understand NASA/space science concepts well enough to be effective in facilitating NASA/space science learning for their patrons – matched Post-survey responses, a 10% increase from Pre-survey results

Library staff felt prepared to host the *Discover NASA* exhibit after receiving *FOTOS* training and support (Post-survey results).

- ✓ 93% (14/15) of staff agreed or strongly agreed that the *Discover NASA* workshop prepared them to host the exhibit in their library
- ✓ 64% (7/11) found the webinars helpful preparing exhibit-related programming
- ✓ 93% (13/14) indicated the training/resources/support prepared them to partner with other organizations to implement programming at their library
- ✓ 93% (13/14) knew where to get support, if needed, as they implemented the *Discover NASA* exhibit in their library

Library staff knowledge, interest, and confidence about STEM-based library programming increased based on their experience with the *Discover NASA* exhibit according to retrospective Before and Now (after) Post-survey responses.

- ✓ There was a 37% increase in library staff knowledge about how to develop and facilitate STEM-based library programming
- ✓ Library staff had a 26% increase in their level of confidence about how to develop and facilitate STEM-based library programming
- ✓ Library staff experienced a smaller increase (14%) in library staff interest in developing and facilitating STEM-based library programming
- ✓ Library staff listed examples of how they personally increased their knowledge, interest, and confidence about STEM-based library programming (Post-survey:)
 - “I am much more interested in and tuned into NASA activities and discoveries. Due in part to our experience hosting *Discover NASA*, our library has been chosen to host a Smithsonian Water Ways exhibit in 2019.”
 - “The *Discover NASA* project gave me more tools to implement quality STEM programs at our library. It gave me a reason to partner with other community resources to bring quality programs to the library. It also helped [our library] to partner with schools and other educational entities - I had a very specific, high quality, interesting educational program to offer them.”
 - “It engaged me and stimulated my creativity in designing, developing, and initiating programming. I felt confident working with patrons at the exhibit stations, explaining how they worked and the concepts.”
 - “Getting to work with the exhibit and accompanying programs also really boosted my own confidence in the creation and facilitation of STEM activities. Last but not least, though I have been a NASA fan for a while, it helped to rekindle my curiosity and support and give me a deeper understanding.”

***FOTOS* Library staff see encouraging STEM learning as a role for their library.**

- ✓ According to Post-survey responses, 94% (17/18) of host library staff indicated they see a role for their library in encouraging STEM learning (one staff member was not sure)

- ✓ The following are examples of what library staff listed to explain why their libraries have a role in STEM learning:
 - “Public libraries are a pillar of education for all. We have an opportunity and a responsibility to offer educational experiences for our communities. STEM learning is part of this and highly important for the continued development and health of our society, both intellectually and economically.”
 - “STEM education is a priority to our library.”
 - “I believe that libraries can and should play a key role in supporting STEM learning. They were well-positioned to partner with their local schools and other experts.”
 - “We are clearly a destination for supplemental STEAM/STEM learning. Patrons look for our STEAM/STEM based programming.”
 - “Encouraging STEM learning has always been a goal of the library, but seeing the response to the exhibit has only increased our desire to emphasize STEM in as much of our programming and activities as possible.”
 - “I think the library offers a chance for kids to explore STEM without having to worry about grades or coming up with the "right" answers. Also, they can pick and choose what programs interest them. We also help patrons find resources so that they can continue their exploring at home.”

One resource available to *FOTOS* library staff was the *STAR Net* Community of Practice. Prior to *FOTOS*, 58% (11/19) of library staff had not participated in any communities of practice, four were not sure, and four had participated in such communities.

FOTOS Library staff found the *STAR_Net* CoP website useful.

- ✓ 74% (14/19) of *FOTOS* Post-survey respondents had looked at the *STAR Net* CoP
- ✓ 43% (6/14) of library staff visited the *STAR Net* website about every other month
- ✓ 75% (9/12) of library staff found access to webinars, and 83% (10/12) found exhibit-specific resources/support useful or very useful
- ✓ 67% (8/12) of those who had used the *STAR Net* CoP found networking with other library staff and participating in science discussion groups useful or very useful
- ✓ 75% (9/12) of library staff found learning about best practices in science education useful or very useful
- ✓ Library staff found networking with science professionals least useful – 15% (2/13) found it not useful, and 31% (4/13) had not used it

[The workshop] gave me a great look into what to expect - how to manage and set up the exhibit. Most importantly - how to use the exhibit to maximize my library's potential as a STEM resource and be seen as a continuing valuable asset in our community.

FOTOS Workshop Participant

Conclusion: The *FOTOS* project team successfully built the capacity of the host libraries to deliver STEM learning experiences for their communities. Host library staff received training via an in-person workshop, webinars, SSI developed programming and resources, and access to the *STAR Net* CoP. In addition, SSI staff provided individual support as needed via email, an online platform, and phone.

All host libraries (100%) developed and conducted exhibit-related programs and collaborated with outside partner organizations for program development and

implementation. The *FOTOS* “pre-exhibit” workshop held on November 17-18, 2015 helped library staff feel prepared to deliver informal STEM programming and they found the *STAR Net* CoP website useful. Library staff reported an increase in their knowledge of *Discover NASA* exhibit-related topics and felt prepared to host the *Discover NASA* exhibit due to *FOTOS* training and support.

Library staff knowledge, interest, and confidence about STEM-based library programming increased based on their experience with the *Discover NASA* exhibit according to retrospective Before and Now (after) Post-survey responses. *FOTOS* library staff see encouraging STEM learning as a role for their library.

Goal Three. *Create innovative collaborations between project team members, NASA mission partners, and public libraries, to provide sustained STEM programming for both youth and adults.*

Evaluation Questions: To what extent do *FOTOS* team members, library staff, and NASA mission partners develop partnerships to provide STEM programming for youth and adults?
To what extent do libraries work with NASA resources, people and/or programs?

Prior to participating in *FOTOS*, just three libraries had partnered with a college or university, three had partnered with a science center/museum and one had partnered with a zoo/aquarium. In addition, on average, only 11% of host library programming was STEM-related in the year prior to their participation in *FOTOS*.

Goal 3 - OUTCOMES

- 1) Programs leverage existing resources from the library, local community, and online community of practice
- 2) Partnerships develop and are sustainable

***FOTOS* libraries (100%) coordinated with STEM professionals and/or NASA mission partners to deliver programs related to *Discover NASA* exhibit topics.**

- ✓ 5 of 6 libraries partnered/collaborated with exhibit-related organizations for program development and implementation
- ✓ 4 libraries reported using NASA partner programming in the six-months since the exhibit left their library
- ✓ 4 libraries reported using outside partners to conduct STEM programming since the exhibit left their library
- ✓ 93% (13/14) of library staff on the Post-survey reported they agreed or strongly agreed project training/resources/support prepared them to partner with other organizations to implement programming at their library

***FOTOS* libraries used a variety of partners to develop and/or provide STEM learning experiences including science centers/museums, universities and colleges, retired teachers/STEM professionals, astronomy societies, and NASA-affiliated groups/individuals.**

- ✓ Examples of specific partners are listed below:
 - Retired or in-service science, math and physics teachers
 - Retired rocket scientist
 - Astronomy, physics, math, and science professors

- Northern Colorado Astronomical Society
 - NASA Langley representatives
 - Virginia Air and Space Center
 - Director of NAV/NASA Space Grant
 - NASA in Kansas
 - Wichita State University – High Altitude Balloon Club/ Rocket Club
 - Cowley County MIS/GIS Department
 - Kansas Aviation Museum
 - Director of Lowell Observatory
 - Cradle of Aviation and the
 - Long Island Children’s Museum
 - Amateur Observers Society
- ✓ A library host staff member talked about the influence of the *Discover NASA* exhibit to form a new partnership, “Our partnership with NASA Langley came about because of *Discover NASA*. We had been endeavoring to build contacts there off and on, but it wasn’t until we got the *Discover NASA* exhibit that we had any real luck.”
 - ✓ One library plans to continue with star-gazing and dark sky programs (using partners) and is looking forward to putting together a mobile Makerspace that will enhance both programs
 - ✓ Another library will continue their “Young Astronauts” program with the Amateur Observers Society and has booked the Cradle of Aviation and other Science Teachers to hold Eclipse programs all summer [summer of 2017]

We developed new relationships with each of our NASA presenters. Following Dr. [name]’s presentation the conversation turned to the creation of a robotics team for [county]. Dr. [name] has offered to assist with the development of a team.

Host library

Conclusion: *FOTOS* team members, library staff, and NASA mission partners developed partnerships to provide STEM programming for youth and adults at all *FOTOS* libraries. Libraries worked with NASA resources, people and/or programs to coordinate and implement *Discover NASA*-related programming at the host sites. Some *FOTOS* libraries created new partnerships that have gone beyond the time frame of the exhibit. Partners included science centers/museums, universities and colleges, retired teachers/STEM professionals, astronomy societies, and NASA-affiliated groups/individuals. The *FOTOS* project clearly met its goal of creating innovative collaborations between project team members, NASA mission partners, and public libraries to provide sustained STEM programming for both youth and adults at host libraries. One library staff member summed it up when talking about

sustaining their STEM efforts, “Encouraging STEM learning has always been a goal of the library, but seeing the response to the exhibit has only increased our desire to emphasize STEM in as much of our programming and activities as possible.”

Goal Four. Advance our understanding of effectively reaching underserved and underrepresented library populations in rural and urban communities.

Evaluation Questions: Is the *FOTOS* exhibit and programming effective in reaching underserved library populations? To what extent does *FOTOS* succeed in reaching the targeted library participants at the host libraries?

FOTOS host libraries indicated their access to STEM programming and experience in delivering STEM programs in their *FOTOS* applications, the exhibit Pre and Post-surveys, and during library staff interviews. In addition, the host libraries shared their community's population demographics and selected a variety of populations of underserved and underrepresented library populations in their rural and urban communities as their target groups to reach with the *Discover NASA* exhibit and programming.

Goal 4 - OUTCOMES:

- 1) Selected host libraries have little or no access to STEM programming
- 2) Host libraries are successful in attracting participation representative of their communities' demographics

Selected *FOTOS* libraries had little or no access to STEM programming.

- ✓ In the year prior to the *Discover NASA* exhibit *FOTOS* libraries reported doing an average of 558 programs of which just 59 were STEM related
- ✓ On the Pre-survey, library directors rated new opportunities to partner with regional and national STEM organizations and contacts within the STEM education and research communities (local and/or national) the most often as what would be helpful to them in increasing the amount of STEM programming opportunities to their community
- ✓ In the six months after the exhibit left the library, 68% of library staff (13/19) reported patrons had asked for more exhibit-related (STEM) activities/programs

***FOTOS* libraries identified audiences historically underrepresented in STEM fields and successfully provided targeted audiences with STEM learning experiences.**

- ✓ One library targeted English Language Learners, and Latino students as their underrepresented audience – they arranged tours for interested schools and one school brought all of their 4th grade classes to see the exhibit that included the targeted audience
- ✓ Another library targeted a specific group of children they had met at a children's clinic – they conducted STEM outreach and gave parents fliers and a newsletter with information about the exhibit – they estimated about 40% of the people they signed up came to the programs and noted that it was their best response to date
- ✓ Two libraries identified their audience as those living in poverty – at one site it was 25% according to the 2016 U.S. Census figures -- they reported that attendees to the exhibit and programming matched "to a great extent," the other site had success with those within walking distance of the library and moderate success with field trips from local schools – they felt it was moderate due to staff capacity and school monetary restrictions, and the exhibit tour dates overlapping with winter holidays
- ✓ Rural patrons were successfully targeted at another library that heavily publicized the exhibit using a variety of methods such as fliers, radio spots, posters, school visits, and multiple press releases
- ✓ Another library targeted and successfully recruited rural, girl audiences not exposed to STEM from their state via a two-day program where the girls were introduced to topics such as space exploration, living and working in space, and what NASA does while working on earning badges
- ✓ One library reported that the 1,800 plus people in their scheduled tour groups were primarily school children, over half of whom were considered "at risk" (a targeted group)
- ✓ A library also reported they targeted females and their program attendance had included a large percentage of females including a Mars Rover LEGO building workshop that had as many females as males attending – they also had a high percentage of females attend a "Light It Up"

workshop led by a female university student

FOTOS libraries were successful in attracting participation representative of their communities' demographics.

- ✓ One library noted that because the exhibit was accessible to patrons any time the library was open, a great deal of their community was able to experience *Discover NASA* – this same library reported programming attendance as typically a large portion of Caucasian patrons followed by Latino and others
- ✓ Other libraries felt they matched their community demographics due to the large turnout for the *Discover NASA* exhibit, and some felt they reached a far greater audience due to their publicity efforts
- ✓ One library felt the central location of the library (they serve multiple cities) and the location of the exhibit within their library helped them realize their goal of attendance matching the demographics of their community
- ✓ Another library noted that to a large extent visitors and program attendees were mostly families with children followed by seniors 65 and older which matched the population characteristics of their community
- ✓ As one library director noted, “As anyone who works with teens know, they can be a difficult bunch to draw in. That being said, once we were able to engage them in programs specific for them, they were glad they got involved,” and another who stated, “It brought in people from our community and others who have never been to the Library. It also allowed us to improve our STEM offerings.”
- ✓ Though all libraries said they were successful in reaching audiences historically underrepresented in STEM fields, a few libraries also mentioned instances where they tried to reach out to specific audiences that were not as successful such as lower attendance at adult programs

Clearly, the exhibits are making STEM education more accessible. Once students are introduced to the possibilities of their succeeding in science, they are more likely to view science as a possibility in their futures. Also, [I] think it is a boon to libraries in increasing their profiles and relevancy to their communities. The exhibits are expanding the mission of libraries and how people look at libraries.

Host Library

Conclusion: The project goal of advancing understanding of effectively reaching underserved and underrepresented library populations in rural and urban communities was mostly achieved for *FOTOS* host libraries. Prior to the *FOTOS* project most host libraries had little access to STEM programming. The project provided training, programming/activities, and resources for libraries to use or develop STEM programming and then implement in their libraries.

The *Discover NASA* exhibit and programming in host libraries was effective in reaching underserved library populations. *FOTOS* host libraries identified audiences historically underrepresented in STEM

fields in their communities and then successfully provided STEM learning experiences that included those targeted audiences. In addition, *FOTOS* libraries were successful in attracting participation representative of their communities' demographics overall though several mentioned low attendance at programs aimed at adults.

Goal Five. *Disseminate project resources and evaluation findings.*

Goal five was not included in the external evaluation.

Summary

Findings from the external evaluation of the NASA CP4SMP+ *FOTOS* project’s implementation indicate that *FOTOS* met or exceeded all project outcomes for host libraries. One hundred percent of the host libraries (6) viewed the exhibit as a success for their library. All host libraries developed and conducted exhibit-related programs delivered by library staff and collaborated with outside partner organizations for other program development and implementation. Libraries worked with NASA resources, people and/or programs to coordinate and implement *Discover NASA* related programming at the host sites.

The exhibit enhanced the library experience for our regular, new and out of town patrons in a fun, inspirational, and educational way. It also showed the public (and even some within our own library admin) how dynamic libraries can be. This was reflected in the verbal and written feedback from the patrons, and in the way patrons, staff, and partners still come in and talk about the exhibit.

FOTOS Host Library Staff Member

Some *FOTOS* libraries created new partnerships that have gone beyond the time frame of the exhibit. Library staff knowledge, interest, and confidence about STEM-based library programming increased based on their experience with the *Discover NASA* exhibit according to retrospective Before and Now (after) Post-survey responses. Library staff felt prepared to host the *Discover NASA* exhibit due to *FOTOS* training and support.

Discover NASA exhibit attendance was considered high by library staff and at some libraries, actually increased their overall library attendance and or new patron registrations. All host libraries offered programming associated with the *Discover NASA* exhibit topics, and several offered tours of the exhibit, field trips for local schools, and other special events outside regular library hours such as star gazing parties and “special movie nights.” Youth and adult library patrons at *FOTOS* host libraries became more interested in, and engaged in, the NASA/STEM topics presented in the *Discover NASA* exhibit and related programming. In

addition, the four libraries reporting circulation statistics for *Discover NASA* related materials showed increases in circulation ranging from 17% to 182% during the exhibit when compared to the same timeframe one year prior.

The goal of advancing understanding of effectively reaching underserved and underrepresented library populations in rural and urban communities was achieved for *FOTOS* host libraries. The *Discover NASA* exhibit and programming in host libraries was effective in reaching underserved library populations. *FOTOS* host libraries identified audiences historically underrepresented in STEM fields in their communities and then reported successfully provided STEM learning experiences that included those targeted audiences. In addition, *FOTOS* libraries were successful in attracting participation representative of their communities’ demographics overall.

Areas of Consideration

Suggestions regarding the exhibit:

- A video of what the exhibit pieces look like assembled and the actual assembly process might be helpful as some libraries had to wait a long time for their turn on the tour and forgot some of the unpacking and assembling tips and tricks they had learned at the training.
- An updated diagram of how the exhibit should be packed might be helpful as one library found the layout of how the pieces should be placed in the crates confusing.
- An estimate of how long unloading and unpacking takes and the amount of help needed to unload and load the exhibit crates would be helpful for library planning purposes.
- Some tall crates had large casters which made it difficult to store and move. One library suggested breaking it up into smaller pieces/crates.
- Suggestions on where to place certain pieces due to the design of power and Ethernet jacks prior to the exhibit arriving would be helpful for some libraries. One library was not able to use a wireless router due to the library's security policies.
- One library asked if there was a way to make sure all the components were working properly before the exhibit arrived so they did not lose time while they were being repaired or replaced.
- Suggest to host libraries that they keep the noisier pieces such as the "International Space Station" away from the circulation desk or areas where staff work so they do not have to listen to the repetitive sounds such as the "The Lion Sleeps Tonight" music.

Suggestions regarding programming/activities:

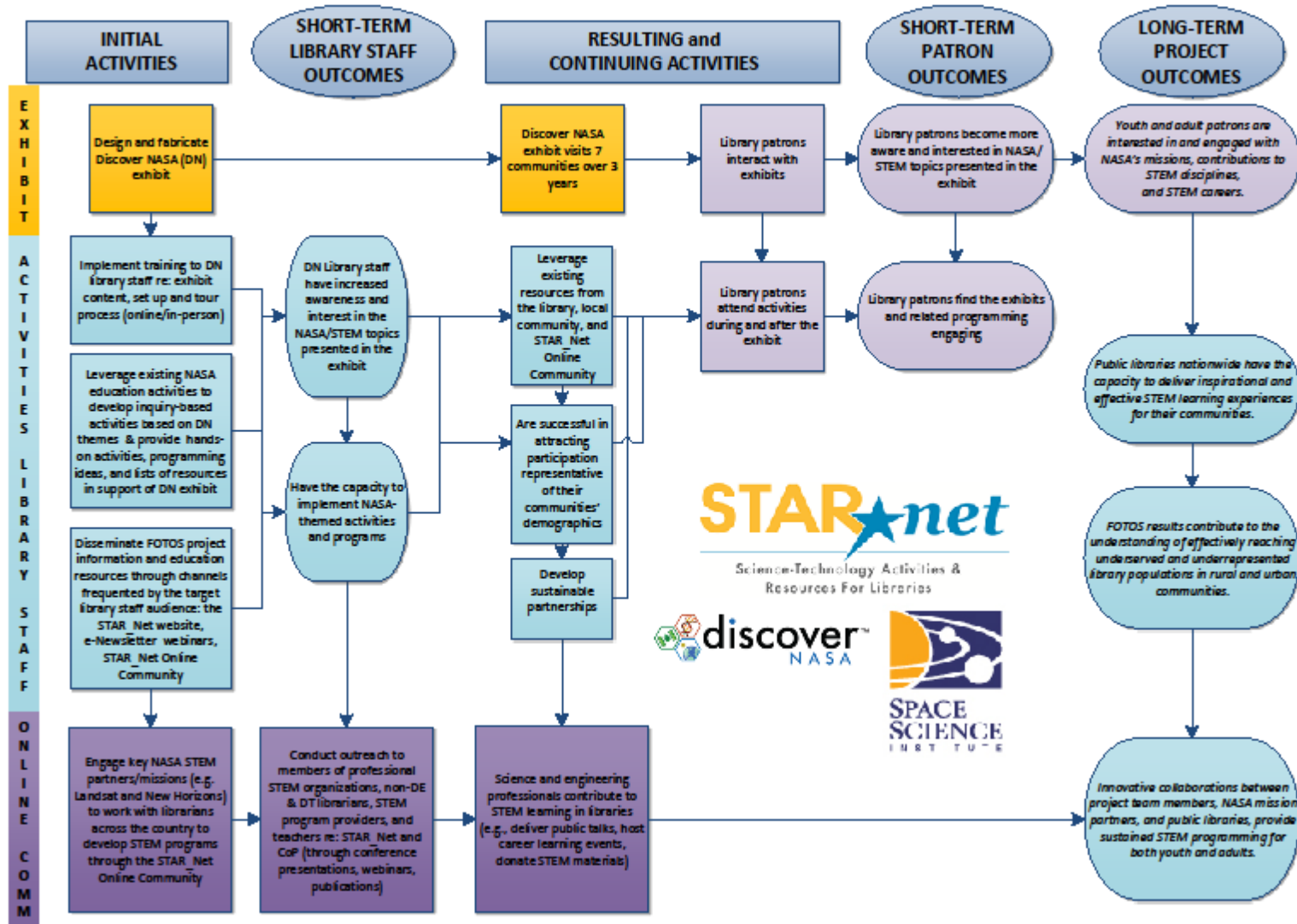
- Provide ideas for conducting school field trips and tours – one library found larger school tours a challenge due to the restricted time allowed.
- Provide "cheat sheets" for station content. One library talked about some of the content being difficult to comprehend depending on the age of the individual touring the exhibit. They gave the example of the plutonium rod station and solar power station being challenging for visitors to understand and requiring a great deal of staff explanation for visitors.

Suggestions for the timing of the tour:

- Provide ideas for bringing in school-age children to libraries that have the exhibit in the summer – one library found it difficult to bring in school tours during the summer.

Appendix A: *FOTOS* Logic Model

From Our Town to Outer Space (FOTOS) Logic Model



Appendix B: *FOTOS* Goals, Outcomes, Indicators, and Evaluation Questions

FOTOS Goals, Outcomes, Indicators, and Evaluation Questions

EDC worked with FOTOS staff to develop a project logic model. The logic model was then used to create the matrix of evaluation questions, outcomes, indicators in Table A.

Table A. FOTOS Project Goals Aligned with Outcomes, Indicators, and Evaluation Questions

Goal 1. Increase youth and adult patrons' interest and understanding of NASA's missions, contributions to STEM disciplines, and STEM careers	
<p>Outcomes:</p> <ol style="list-style-type: none"> 1) Youth and adult library patrons at host libraries find the exhibits and related programming engaging 2) Library youth and adult patrons at host libraries become more interested in NASA Missions and STEM careers <p>Evaluation Question:</p> <ol style="list-style-type: none"> 1) To what extent do youth and adult library patrons at FOTOS host libraries become more interested in, and engaged in the NASA/STEM topics presented in the exhibit and related programming? 	<p>Indicators:</p> <p>Library patrons that engage with the <i>Discover NASA (DN)</i> exhibit and programs:</p> <ol style="list-style-type: none"> 1) <i>spend time engaging with exhibit</i> 2) <i>attend library programs associated with the exhibit</i> <p>Library patrons report increased interest and engagement in DN topics:</p> <ol style="list-style-type: none"> 1) <i>indicate that the DN exhibit or program increased their interest in learning more about the exhibit topics</i> 2) <i>indicate they plan to return to DN exhibit/library to learn more about ideas presented in the exhibit</i> 3) <i>borrow library materials to learn more about the specific idea(s) presented in the exhibit</i> 4) <i>indicate they plan to or would like to attend another educational institution or events to learn more about exhibit topics</i> <p>Library patrons report increased interest in NASA Missions and/or STEM careers:</p> <ol style="list-style-type: none"> 1) <i>indicate that the exhibit or program increased their awareness of NASA Missions and/or STEM careers</i>
Goal 2. Build the capacity of public libraries nationwide to deliver inspirational and effective STEM learning experiences for their communities.	
<p>Outcomes:</p> <ol style="list-style-type: none"> 1) Host librarians/staff improve their knowledge about NASA/STEM topics presented in the exhibit 2) Host librarians/staff are more interested in, knowledgeable about, and confident about how to develop and deliver STEM-based library programming <p>Evaluation Question:</p> <ol style="list-style-type: none"> 1) Does the professional development delivered by FOTOS help host librarians deliver informal STEM programming? 	<p>Indicators:</p> <p>DN Host Librarians:</p> <ol style="list-style-type: none"> 1) <i>indicate that the DN training and resources increased their knowledge of the DN exhibit topics</i> 2) <i>facilitate activities related to the DN exhibit while they have exhibit</i> 3) <i>facilitate activities related to the DN exhibit after the exhibit has left their library</i> 4) <i>report and are observed to (during site visits) facilitate visitor interactions with the exhibit</i> 5) <i>adapt and deliver activities related to the exhibit provided by the project team</i> 6) <i>develop and deliver their own activities and/or identify other high quality activities</i>

	<p><i>related to the exhibit (and share these activities through the CoP)</i></p> <p>7) <i>contact and coordinate with DN exhibit topic-related professionals/NASA mission partners to deliver programs related to exhibit topics</i></p> <p>8) <i>increase their interest in developing and facilitating STEM-based library programming</i></p> <p>9) <i>increase their knowledge about how to develop and facilitate STEM-based library programming</i></p> <p>10) <i>increase their confidence about how to develop and facilitate STEM-based library programming</i></p>
<p>Goal 3. Create innovative collaborations between project team members, NASA mission partners, and public libraries, to provide sustained STEM programming for both youth and adults.</p>	
<p>Outcomes:</p> <p>1) Programs leverage existing resources from the library, local community, and online community of practice</p> <p>2) Partnerships develop and are sustainable</p> <p>Evaluation Questions:</p> <p>1) To what extent do <i>FOTOS</i> team members, library staff, and NASA mission partners develop partnerships to provide STEM programming for youth and adults?</p> <p>2) To what extent do libraries work with NASA resources, people and/or programs?</p>	<p>Indicators:</p> <p>DN Host Librarians:</p> <p>1) <i>coordinate with STEM professionals and NASA mission partners to deliver programs related to exhibit topics</i></p> <p>2) <i>indicate that new collaborations develop among librarians participating in DN, between librarians and STEM professionals/NASA mission partners (including in their communities)</i></p>
<p>Goal 4. Advance our understanding of effectively reaching underserved and underrepresented library populations in rural and urban communities.</p>	
<p>Outcomes:</p> <p>1) Selected host libraries have little or no access to STEM programming</p> <p>2) Host libraries are successful in attracting participation representative of their communities' demographics</p> <p>Evaluation Questions:</p> <p>1) Is the <i>FOTOS</i> exhibit and programming effective in reaching underserved library populations?</p> <p>2) To what extent does <i>FOTOS</i> succeed in reaching the targeted library participants at the host libraries?</p>	<p>Indicators:</p> <p>DN Host Librarians:</p> <p>1) <i>reach the audience(s) they proposed to reach in their application</i></p> <p>2) <i>reach new audiences through programming provided during the exhibit</i></p> <p>3) <i>indicate patron attendance at exhibit programming matches the communities' demographics</i></p>
<p>Goal 5. Disseminate project resources and evaluation findings.</p>	
<p>Goal 5 was not addressed in the external evaluation</p>	

Appendix C: *FOTOS* Evaluation Methodology

FOTOS Evaluation Methodology

The summative evaluation of the *FOTOS* project was conducted by Educational Development Center (EDC) and employed a mixed-methods design based on the *STAR Net* Project (National Science Foundation # 1010844) evaluation plan. The evaluation investigated the implementation of the project, progress toward achieving Goals 1-4, and more specifically, the impact on library staff and patrons from participating libraries.

The evaluation methods included administration of pre- and post-exhibit surveys to library staff who hosted the exhibits, site visits to two selected libraries, and conducted interviews with staff at the libraries that hosted the exhibit, conducted interviews and collected patron surveys, and reviewed final reports from host libraries. Institutional Review Board approval was received for the evaluation plan and instruments before data collection began.

The evaluation focused on investigating gains in awareness, engagement and interest, and capacity to implement NASA-themed activities and programs. The two primary goals of the *FOTOS* evaluation were to provide formative feedback about project implementation to *FOTOS* leadership, and to provide summative feedback on the overall effects of the project on stakeholders (patrons and library staff).

The evaluation instruments and data collection methods are shown in Table A and described in more detail after the table. Post-exhibit data were collected on a rolling basis: immediately after the exhibit left each library (the Final Report Form, interviews with library staff, and some circulation records), six months after the exhibit left each library (the Library Six-Month Post-Exhibit Survey).

Table A. Evaluation Instruments and Administration Notes

Evaluation Instrument	Administration Date	Participation/Response Rate
<i>Discover NASA</i> Training Satisfaction Survey	November 2015	<ul style="list-style-type: none"> All 6 <i>Discover NASA</i> directors and coordinators who attended training (12 total, 100% response rate)
Librarian Pre-Exhibit Survey	October/November 2015	<ul style="list-style-type: none"> 5 of 6 <i>Discover NASA</i> directors 4 of 6 <i>Discover NASA</i> coordinators 11 other library staff involved in project n=20
Librarian Six Month Post-Exhibit Survey	Six months after <i>Discover NASA</i> exhibit left each library	<ul style="list-style-type: none"> 6 of 6 <i>Discover NASA</i> directors 4 of 6 <i>Discover NASA</i> coordinators 9 other library staff involved in project 14 library staff involved in project completed both surveys (for matching) n=20
Interviews with <i>Discover NASA</i> directors and coordinators	Within one month of the <i>Discover NASA</i> exhibit leaving each library or during site visits	<ul style="list-style-type: none"> Library staff from 6 <i>Discover NASA</i> libraries (including interviews conducted during site visits)
Library Patron Survey	While <i>Discover NASA</i> exhibit was at each library	<ul style="list-style-type: none"> 573 patrons from 6 <i>Discover NASA</i> libraries
Site Visits to a total of two <i>Discover NASA</i>	Interview library staff and patrons; observe patrons interact with exhibit; observe	<ul style="list-style-type: none"> Observed library patron interactions with the exhibit (some observations involved observing multiple patrons) Conducted patron interviews

Evaluation Instrument	Administration Date	Participation/Response Rate
	library staff conduct exhibit programming	<ul style="list-style-type: none"> • Interviewed library staff • Observed 5 exhibit-related library programs
Final Report Form	Immediately after <i>Discover NASA</i> exhibit left each library	<ul style="list-style-type: none"> • 5 of 6 reports from <i>Discover NASA</i> libraries
Exhibit-related circulation records	During the <i>Discover NASA</i> exhibit timeframe and the same timeframe one year prior	<ul style="list-style-type: none"> • Pre- and during records from 4 <i>Discover NASA</i> libraries

- **Library Patron Survey** – A one-page survey was provided to each library to administer to adult library patrons interacting with the exhibit or attending programming while the exhibit was at the library. The survey included a set of two questions using a Likert-type scale regarding their interest in the exhibit, and its impact on their interest in learning more about exhibit-related topics. Patrons were also asked how long they had spent interacting with the exhibit, and to provide basic demographic information. EDC asked the Project Director and Coordinator to place them in multiple prominent locations in the library, such as near the exhibit components and at the circulation desk, and to administer them after programming. The Patron survey results can be found in Appendix D.
- **Discover NASA Workshop Satisfaction Surveys** – A survey was administered to 12 Project Directors and Coordinators on day two of the two-day *Discover Tech* training in November 2015. Questions focused on satisfaction with the training. The survey results can be found in Appendix E.
- **Library Staff Discover NASA Pre-Exhibit Survey** – An online survey was administered to all of the *FOTOS* project directors, project coordinators, and other library staff identified as having a role in hosting the exhibit and/or delivering exhibit-related programming.³ The survey collected background information about library staff members’ prior experience with STEM programming, including their knowledge of and comfort with facilitating such activities. Directors were asked several additional questions about the characteristics of their library communities. The survey was administered in October/November 2015, shortly before the *Discover NASA* libraries attended the two-day exhibit training. The pre-survey results can be found in Appendix F.
- **Library Staff Six Month Discover NASA Post-Exhibit Survey** – This online survey was administered to the same *FOTOS* Project Directors, Project Coordinators, and other library staff who completed the Pre-survey. The survey was administered on a rolling basis six months after the *Discover NASA* exhibit left each library. Questions focused on library staff members’ experience with the exhibit, related programming, and the *STAR Net* CoP as well as the continuing impact of their participation in the project during the six months since the exhibit left their libraries. Staff members were asked if

³ Each *FOTOS* library had a “Project Director,” who had primary responsibility for overseeing the exhibit and related programming, as well as a “Project Coordinator,” who assisted with implementation. Project Directors were not necessarily the directors of their libraries. Some libraries also had other staff who were involved in delivering programming and/or monitoring the exhibit. The Project Coordinator version of the survey was administered to the coordinators, as well as to any other staff the project director had identified as having a key role in the project.

they had conducted any NASA/STEM-related programming since the exhibit left or if their library had acquired any additional *Discover NASA*-related materials for patrons. Library staff were also asked the same questions as on the pre-survey regarding their knowledge of exhibit-related topics and comfort with facilitating STEM/NASA related programming; pre- and post-surveys were matched for analysis of these questions. The post-survey results can be found in Appendix F.

- **Library Staff Interviews** – Interviews were conducted with the *Discover NASA* directors and coordinators within a month after the exhibit left their library (with the exception of two libraries that were interviewed during the site visits). Library staff were asked about the characteristics of their library community; their observations regarding patrons’ interactions with the exhibit; their experiences with the professional development, provided activities, and the *STAR Net* CoP; and their reflections on the broader impact of the project on themselves and their library. Interviews were conducted by phone for 45-60 minutes each; most were conducted jointly with all staff members who were involved in the project at each library.
- **Site Visits** – The evaluator visited two *Discover NASA* libraries while they hosted the exhibits. During each two-day site visit, the evaluator observed patrons while they interacted with the exhibit, interviewed a sample of library patrons after they had interacted with the exhibits or programming, interviewed the library staff who were responsible for coordinating the exhibit, and observed library staff as they implemented exhibit-related programs.
- **Final Report Form** – Project Directors were required to complete this form, which was developed by NCIL and EDC, within 30 days of the exhibit leaving their library. The form asked libraries to describe the programs they had implemented while the exhibit was at their library, whether informal educational groups had seen the exhibit. Libraries were also asked to enumerate the demographics of visitors to their library, to the exhibit, and to their exhibit-related programming. NCIL sent each library a Word version of the form in advance so that they would know what information was required. Five of Six libraries completed the form.
- **Exhibit-Related Circulation Records** – Libraries were asked to provide circulation records for holdings related to the *Discover NASA* exhibits as part of their final report: (1) during the time they hosted the exhibit, and (2) during the equivalent period one year before the exhibit came to the library. Libraries had the instructions with the call numbers and dates for what circulation records were requested as part of the final report that was covered during the training. Four of six libraries provided circulation numbers.

Results from the above the instruments are included in this report.

Appendix D: *FOTOS* Library Patron Survey Results

FOTOS Patron Survey Results - Six Project Libraries

- 573 responses (Exhibit and programming survey respondents)

	Count	Percentage
Library #1	183	32%
Library #2	115	20%
Library #3	63	11%
Library #4	69	12%
Library #5	90	16%
Library #6	53	9%

Please indicate how much you agree or disagree with each of the following statements.

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	Mean On 1-5 scale
I learned something new from the <i>Discover NASA</i> exhibit (or <i>Discover NASA</i> program I just attended)—something I did not know before. (n=569)	2.5% (14)	0.9% (5)	4.4% (25)	32.5% (185)	59.8% (340)	4.5
I feel confident that I could explain one thing I learned from the <i>Discover NASA</i> exhibit (or <i>Discover NASA</i> program I just attended) to a family member or a friend. (n=565)	2.3% (13)	2.7% (15)	16.6% (94)	35.9% (203)	42.5% (240)	4.1
I have increased my knowledge about NASA missions, impacts, & space science as a result of visiting the exhibit (or <i>Discover NASA</i> program I just attended). (n=562)	2.1% (12)	2.5% (14)	12.3% (69)	36.3% (204)	46.8% (263)	4.2
The <i>Discover NASA</i> exhibit (or <i>Discover NASA</i> program) increased my interest in learning more about NASA missions, impacts, and space science. (n=560)	3.4% (19)	2.5% (14)	15.5% (87)	33.4% (187)	45.2% (253)	4.1
I plan to learn more about NASA missions, impacts, and space science using library resources (such as looking for books or videos). (n=560)	3.2% (18)	7.9% (44)	18.8% (105)	34.3% (192)	35.9% (201)	3.9
I would recommend the <i>Discover NASA</i> exhibit to others. (n=564)	2.1% (12)	0.7% (4)	8.3% (47)	23.2% (131)	65.6% (370)	4.5
The <i>Discover NASA</i> exhibit is a valuable addition to my library. (n=562)	2.5% (14)	2.1% (12)	6.9% (39)	21.4% (120)	67.1% (377)	4.5

If you had children or young people with you, please indicate how much you agree or disagree with the following. (Skip these questions if they do not apply to you.)

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	Mean On 1-5 scale
The children/young people with me were very interested in the <i>Discover NASA</i> exhibit (or <i>Discover NASA</i> program we just attended). (n=358)	2.5% (9)	0.8% (3)	10.6% (38)	25.4% (91)	60.6% (217)	4.4
The children/young people with me learned something they did not know before from the <i>Discover NASA</i> exhibit (or <i>Discover NASA</i> program we just attended). (n=356)	2.5% (9)	0.6% (2)	7.9% (28)	28.7% (102)	60.4% (215)	4.4

How many programs have you attended at your library (as of today)? Select one: (n=525)

	Count	Percentage
None	118	22%
1 or 2 programs	280	53%
3 or 4 programs	68	13%
5 or more programs	59	11%

How many times have you visited the exhibit at your library (as of today)? Select one: (n=536)

	Count	Percentage
None	68	13%
Once or twice	350	65%
3 or 4 times	68	13%
5 or more times	50	9%

About how many minutes have you spent looking at the exhibit? If you have attended the exhibit more than once, please add the total the number of minutes you have looked at the exhibit. (n=480)

	Count	Percentage
15 minutes or less	67	14%
16 – 30 minutes	105	22%
31 – 60 minutes	209	44%
61 – 90 minutes	34	7%
91 – 120 minutes	39	8%
121 minutes or more	26	5%

*Patrons visited between a range of 0 to 840 minutes.

Your Gender (n=549)

	Count	Percentage
Male	217	40%
Female	326	59%
Transgender	6	1%

Your race/ethnicity. Check all that apply:

	Count	Percentage
American Indian or Alaska Native	55	9%
Asian	22	4%
Black, African or African American	55	9%
Hispanic/Latino/Latina	44	7%
Native Hawaiian or Other Pacific Islander	5	1%
White	400	66%
Other; please describe	26	4%

Other; please describe:

- 29 students of different ethnicities
- Combo
- Didn't take enough time to read displays
- Dutch French
- European
- European/American
- German American
- Guam
- Human (3)
- multiracial
- mutt
- Not sure
- Rainbow
- Too many to list

Appendix E: *FOTOS* Workshop Survey Results

FOTOS *Discover NASA* Exhibit Orientation Workshop Nov. 17-18, 2015 at Louisville Public Library Summary of Post-Workshop Survey Results

On November 17-18, 2015, the FOTOS/*STAR Net* team hosted a workshop for the *Discover NASA* exhibit librarians. All 12 library staff who attended the training completed short surveys at the end of the second day of the workshop. Highlights from the surveys include:

- 100% of workshop attendees indicated they feel adequately prepared to host the *Discover NASA* exhibit in their library.
- The hands-on opportunity to explore the *Discover NASA* exhibit and the opportunity to take down and set up the *Discover NASA* exhibit were rated as most useful (each had a mean of 3.92).
- Workshop attendees felt most confident that they knew where to get support, if needed, when their library hosts the *Discover NASA* exhibit.
- Open-ended responses confirm that librarians particularly appreciated the hands-on time with the exhibit. Librarians also reported that the workshop met or exceeded their expectations and that they left with a better understanding of the exhibit.

Complete survey results follow.

Respondents' Ratings of the *Discover NASA* training (n=12)

	Mean	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
The training prepared me to host the <i>Discover NASA</i> exhibit in my library.	4.67	0%	0%	0%	33%	67%
The training prepared me to use activities and resources that accompany the exhibit.	4.92	0%	0%	0%	8%	92%
The resources provided in the training will be useful.	4.92	0%	0%	0%	8%	92%
The training structure provided sufficient opportunities to interact with other library professionals.	4.58	0%	0%	0%	42%	58%
The training provided an effective introduction to the STEM subject areas that are presented in the <i>Discover NASA</i> exhibit.	4.58	0%	0%	0%	42%	58%
The training helped me feel prepared to facilitate exhibit-related learning experiences with my community.	4.50	0%	0%	0%	50%	50%

Respondents' ratings of usefulness of *Discover NASA* training (n=12, unless indicated)

	Mean	Not at all useful (1)	A little bit useful (2)	Somewhat useful (3)	Very Useful (4)	Not applicable to me
Hands-on opportunities to explore the <i>Discover NASA</i> exhibit	3.92	0%	0%	8%	92%	-
The opportunity to take down/set up the <i>Discover NASA</i> exhibit	3.92	0%	0%	8%	92%	-
Information about the <i>STAR Net</i> online community of practice	3.58	0%	8%	25%	67%	-
Information about building partnerships with other organizations	3.42	0%	0%	58%	42%	-
Information about the <i>STAR Net</i> evaluation	3.33	0%	0%	67%	33%	-
Whole Group Discussion: Making a Splash with the Exhibit and Fostering a Ripple Effect to Other Libraries	3.33	0%	8%	50%	42%	-
Information about tour requirements, processes, and details	3.83	0%	0%	17%	83%	-
Information about adult programming resources (n=11)	3.55	0%	0%	45%	55%	1
Demonstrations/hands-on activities with <i>STAR Net</i> programming	3.75	0%	0%	25%	75%	-
Presentation on <i>Interpreting Mars</i> (n=11)	3.64	0%	0%	36%	64%	1
Presentation on <i>Utilizing Local Assets to Complement Exhibits</i>	3.83	0%	0%	17%	83%	-
Time to talk with other library staff who are hosting the exhibit	3.58	0%	8%	25%	67%	-

Respondents' Ratings of *Discover NASA* Training Overall (n=12, unless indicated)

	Mean	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	Not applicable to me
I feel prepared to set up and take down the <i>Discover NASA</i> exhibit.	4.83	0%	0%	0%	17%	83%	-
I feel comfortable integrating <i>STAR Net</i> programming resources into <i>Discover NASA</i> programs at my library. (n=11)	4.64	0%	0%	9%	18%	73%	1
I feel comfortable facilitating <i>Discover NASA</i> programming in my library. (n=11)	4.73	0%	0%	0%	27%	73%	1
I know where to get support, if needed, when my library hosts <i>Discover NASA</i> .	4.92	0%	0%	0%	8%	92%	-
I feel prepared to partner with other organizations to implement programming at my library. (n=11)	4.64	0%	0%	0%	36%	64%	1
I plan to participate in the <i>STAR Net</i> online community of practice.	4.58	0%	0%	0%	42%	58%	-

	Mean	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	Not applicable to me
I plan to reach out to my state's library to tell them my library is hosting <i>Discover NASA</i> and/or to ask for their support. (n=9)	4.56	0%	0%	11%	22%	67%	3
I plan to form a local community of practice related to STEM in libraries.	4.00	0%	8%	25%	25%	42%	12

Overall, did the workshop meet your expectations? Why or why not? (n=12)

(Note: Responses were coded and divided by theme. In some cases, a single respondent's answer appears in more than one category. Respondents' complete open-ended responses appear on page 5.)

Have a better understanding of exhibit

- Yes - I came hoping to have a better understanding of what the exhibit is, looks like, information, etc. I am prepared to run with planning!!
- Yes, getting specifics, logistics, set up/breakdown was very useful.
- Yes, great, useable information. Great ideas/conversation about the exhibit & programs.
- Yes, it gave me a great look into what to expect - how to manage and set up the exhibit. Most importantly - how to use the exhibit to maximize my library's potential as a STEM resource and be seen as a continuing valuable asset in our community.
- Yes. It was great to be able to explore the exhibit, talk with other librarians & learn about the resources available to us through NASA and *STAR Net*.
- Yes. Felt it better and more useful than the *Discover Earth* workshop. Great info on setting up exhibit this time.

Information presentation

- It exceeded my expectation. Quality people and presenters.
- Yes. I did not know what to expect, but found it practical, inspiring & comforting.
- Yes. Very comprehensive and organized so that all info was relevant and easy to understand.

Generally informative

- It exceeded my expectations since I did not know what to expect.
- Yes - I feel confident that we will be ready to the exhibit.
- Yes. This was my first time at such an event and was surprised at how useful it turned out to be.

Do you feel adequately prepared to host the *Discover NASA* exhibit in your library? (n=12)

	Count	Percent
Yes	12	100%
No	0	0%

If No, tell us about areas where you do not feel prepared, and if you have any ideas about how the project team could better help you prepare. (n=1, one respondent indicated that they felt adequately prepared but still had comments about not feeling prepared)

- I think we could have done more with *STAR Net* resources

What aspect of the workshop was most valuable to you? Why? (n=12)

Opportunity to get hands-on experience with the exhibit

- Exhibit viewing & exercises (of set-up and tear-down), exhibit scripts and resources having time to experience the exhibit.
- Exploring the exhibit as patrons, as we have to know how they view it.
- Exploring the exhibit.
- Getting a chance to see/touch/experience the exhibit in person. It helped me understand exactly what the exhibit is and to get really excited about it and how to affect the community.
- Hands on experience
- The hands-on with the exhibit.

Connecting and Sharing

- Brain storming. Sharing frustrations as well as successes.
- Connections with staff.
- Sharing of program ideas and collaboration.

Other

- All
- Community connections - how to make them and with whom to make them along with
- Q&A - Exhibit exploration/explanation - Set up/tear down
- The variety of presenters, teaching styles & discussions kept me engaged.

Other comments or wishes about the training? (n=7)

Offered Praise

- Also so excited about the opportunity and THANK YOU!
- Comet activity was really cool.
- Fabulous. Thank you! (Good lunches and snacks too!)
- Great job! Thanks!
- Thank you for this exciting opportunity!! It is such an honor to be involved in this project :)

Offered Suggestions

- I would have liked icebreakers to involve talking about our libraries and our roles in them to help establish similarities.
- It felt a little bit rushed on the first day. In reality it wasn't too bad, but it felt like presenters were stressing a little.
- Suggestions of funding avenues.
- The paper airplane and impact activity was kind of boring.

Appendix F: *FOTOS* Library Staff Pre-Post Exhibit Survey Results

FOTOS Pre-Post Exhibit Survey Results

Count by library (Pre and Post-survey)

	Pre		Post	
	Count	Percentage	Count	Percentage
Library #1	8	40%	6	30%
Library #2	1	5%	1	5%
Library #3	2	10%	2	10%
Library #4	2	10%	6	30%
Library #5	5	25%	3	15%
Library #6	2	10%	2	10%
Total Count	20		20	

What is your position at the library? (e.g., librarian, youth services coordinator, director, programming developer, IT staff)? The following are examples from Pre and Post Surveys

- Adult Services Manager
- Assistant Director (2)
- Assistant Manager
- Development Coordinator
- Director (2)
- Executive Director
- Head of Children's Services
- Head of Lending Services (Circulation)
- IT
- Director of Public Relations and Programming
- IT Admin
- Librarian
- Library Director
- Technology Coordinator
- Technology Librarian
- Teen Librarian, Media Lab Coordinator
- Teen Library Associate
- Teen Programming Supervisor
- Youth Services Librarian
- Graphic Artists

What is your main role in the *Discover NASA* Exhibit? (Pre and Post-survey)

	Pre		Post	
	Count	Percentage	Count	Percentage
Project Director	5	25%	7	35%
Project Coordinator	4	20%	4	20%
Programming	4	20%	2	10%
Other	7	35%	7	35%

How many years have you worked at this library/branch? (n=19) (Pre-survey Only)

One year or less	6
2-10 years	8
10+ years	5

Library & Community (Pre-survey Only – Library Directors)

In the last 12 months, has your library organized or hosted any activities or programs? (Please include all activities whether or not they were related to STEM (science, technology, engineering and math.))

	Count	Percentage
Yes	5	100%
No (skip to question 2)	0	0%
Not sure (skip to question 2)	0	0%

If yes, please record here the number of activities or programs your library has organized or hosted in the last year. (Please include all activities whether or not they were related to STEM.) (n=5)

Min	43
Max	1,185
Average	558

The number I entered was an: (n=5)

	Count	Percentage
Estimated number	2	40%
Actual number	3	60%

Of all those activities and programs, how many were related to STEM? (n=5)

Min	11
Max	113
Average	59

Who develops STEM programming at your library? Please check all that apply. (n=5)

	Count	Percentage
Library staff	5	100%
Outside partner(s)	4	80%
Volunteer(s)	3	60%
Other (Please specify):	0	0%

Who conducts STEM programs at your library? Please check all that apply. (n=5)

	Count	Percentage
Library staff	5	100%
Outside partner(s)	4	80%
Volunteer(s)	3	60%
Other (Please specify):	0	0%

In addition to your library, there may be other resources available in your community for learning about STEM. Are there other organizations in your community that provide STEM-related resources? If so, please check all that apply. (n=5)

	Count	Percentage
College or university	3	60%
Science museum	2	40%
Children’s museum	1	20%
Other (Please specify): <ul style="list-style-type: none"> Cooperative Extension, Mad Science, Bedtime Math Elementary school Local 4-H Science and Children's museums in neighboring communities, county extension council, county MIS/GIS dept. 	4	80%

Has your library partnered/collaborated with STEM organizations for program development and implementation? Please check all that apply. (n=5)

	Count	Percentage
We have not partnered or collaborated with a STEM organization	0	0%
Science Centers/museums	3	60%
Zoos/aquariums	2	40%
Universities/colleges	3	60%
Community colleges	1	20%
Research institutes – non-federal	0	0%
Research institutes – federal	0	0%
Other (Please specify): <ul style="list-style-type: none"> AZ State SciTech Organization & AZ State Library Cornerstones of Science (Brunswick, ME) Local 4-H 	3	60%

Beyond increasing staff and funding, what would be most helpful to you in increasing the amount of STEM programming opportunities to your community? Please rank the selections by clicking and dragging the selection from 1 – 11, with 1 being the highest. (n = 5)

	Min	Max	Mean
How-to procedures for conducting hands-on STEM activities, crafts, and demonstrations	2	8	3.6
Sources for ready-made programming materials and kits	1	10	4.2
Sample program ideas	1	10	4.8
Exhibition opportunities	1	10	5.4

A list of local and regional STEM education and research organizations	4	8	5.6
Announcements of funding opportunities you can apply for	2	9	5.8
Marketing resources (images and advertising text)	1	9	5.8
Professional training/Continuing education	2	10	6.0
New opportunities to partner with regional and national STEM organizations	4	9	6.6
Contacts within the STEM education and research communities (local and/or national)	3	10	7.2
Other (Please specify): <ul style="list-style-type: none"> Note: This was hard. They are all almost equally important to us as we try to raise the bar. 	11	11	11

This question asks about the racial and ethnic breakdown of your library patrons. It may be easier to fill in this table by referring to your library patron records. Thinking about all your library patrons, please enter the percentage that fall into each racial/ethnic group. Your total should equal 100%. (n=5) Note: All percentages entered by the program directors were reported to be estimates (versus actuals).

Answer	Min Value	Max Value	Average Value
American Indian or Alaska Native	0%	1%	0.60%
Asian	1%	15%	4.60%
Black, African or African American	1%	43%	14.60%
Hispanic/Latino/Latina	5%	28%	12.80%
Native Hawaiians or Other Pacific Islander	0%	1%	0.80%
White	40%	91%	64%
Other or unknown	0%	10%	2.60%

Post Exhibit (Post-survey Only – All Respondents)

It's been about six months since the *Discover NASA* exhibit was at your library. We're interested in whether you view the exhibit as a success for your library. Please select the answer that best reflects your assessment of the exhibit at your library.

Answer	Percentage	Count
Very successful	79%	15
Somewhat successful	21%	4
Neutral	0%	0
Somewhat unsuccessful	0%	0
Very unsuccessful	0%	0
Total	100%	19

Please briefly explain your answer.

- I think we could have done a better job laying the groundwork with partners before the exhibit arrived. This would have helped take the burden of programming off the library staff.

- We made a number of new connections/partnerships because of this exhibit, we had a stellar array of programs, community and guests were excited about subject matter, staff was excited about subject and tech offerings, a number of schools did tours, ALL ages were able to enjoy the exhibit/programs, seeds of creativity were planted that we are seeing beginning to grow (examples: we developed our own Keva planks tables and are working on a wind tunnel to have in our library, and a robotics team for kids is being formed in the area... this project was definitely, without a doubt, VERY successful!
- We continue to hear from the community about the exhibit and the supporting programs. They want to know what is next! In addition, science related programs continue to be popular with both children and adults and we are still offering Ad Astra, our after-school workshop that explores science. Thanks so much for the opportunity!
- The exhibit attracted a lot of attention and served as a way for us to do a big advertising push for the second time after we opened.
- As anyone who works with teens know, they can be a difficult bunch to draw in. That being said, once we were able to engage them in programs specific form them, they were glad they got involved.
- The exhibit enhanced the library experience for our regular, new and out of town patrons in a fun, inspirational, and educational way. It also showed the public (and even some within our own library admin) how dynamic libraries can be. This was reflected in the verbal and written feedback from the patrons, and in the way patrons, staff, and partners still come in and talk about the exhibit.
- We had lots of kids and their parents, grandparents come in for the exhibit. The exhibit brought families together and taught them about NASA and the space program.
- It created a lot of goodwill in the library community. Everyone that visited the event came away with something they did not know about space exploration, but it was also a shared community event.
- It showed the community that the library is not just a place where one can borrow books or movies but a vibrant community center that fosters lifelong learning and curiosity. It drew many non-library users to the library, which in-turn allowed us to show the community that we're no longer your "grandmother's/grandfather's" library.
- We became a destination for the Summer. Parents and Grandparents brought their children and grandchildren here often. We even had people who were angry with us when the exhibit came down. We noticed that fathers would bring their daughters over to look at the Space Station video. We had very successful partnerships with the Cradle of Aviation, the Long Island Children's Museum, and the Amateur Observers Society. We even found new individual science educators. Parents and grandparents told us how thrilled they were with the exhibit, The Young Astronomers program, which has been here for at least five years, had a surge in enrollment. New students were interested in science.
- It brought in people from our community and others who have never been to the Library. It also allowed us to improve our STEM offerings.
- The display was popular with many customers, although somewhat disruptive to regular activities.
- The exhibit itself was widely viewed and generated interest but the adult programs were poorly attended.
- We had an increase in the number of people who came to the library to see the exhibit, although a few of our attendant programs were poorly attended. The children's programs seemed to be the most popular. We appreciated the timing of hosting the exhibit, as many teachers of middle school and high school students brought their classes to the exhibit; many had the students do scavenger hunts to expose them to the full exhibit and the library.
- Patrons loved the exhibit. It was different and exciting for them. We had many people disappointed when it was gone and asked when it would be back:)
- We had wonderful comments from staff and patrons. Many patrons seem to be waiting for the next exhibit! :) Patrons also came looking for the exhibit after it had moved on. Our library district is hoping to get another exhibit - *Discover Health*, I think.

Has your library acquired any additional exhibit-related resources in the six months since the *Discover NASA* exhibit left your library?

Answer	Percentage	Count
Yes	50%	3
No	50%	3
Not sure	0%	0
Total	100%	6

Please check all the types of exhibit-related resources your library has acquired in the six months since the exhibit left your library.

Answer	Percentage	Count
Articles	0%	0
Audiobooks	8%	1
Books	23%	3
Databases	0%	0
DVDs	23%	3
Equipment such as microscopes, robotic kits, circuit kits, etc.	15%	2
eBooks	8%	1
Maps	0%	0
Movies	8%	1
Music	0%	0
Photographs	0%	0
Prints	0%	0
Recordings	0%	0
Web resources	15%	2
Other: please specify	0%	0
Total	100%	13

What reasons did you have for acquiring additional exhibit-related resources for your collection? Check all that apply.

	Percentage	Count
Noticed a gap in the collection due to the exhibit	11%	1
Noticed a gap in the collection due to the related programming	22%	2
Requests from librarians or other library staff	22%	2
Requests from library patrons	11%	1
Requests from K-12 schools	0%	0
Requests from informal educators or programs (for example, after-school program leaders or museums)	11%	1
Requests from STEM professionals	11%	1
Other; please specify	11%	1
Total	100%	9

Other; please specify -the exhibit created an interest in NASA that did not previously exist

In the six months since the exhibit left your library, has your library organized, hosted or promoted any additional exhibit-related activities or programs?

	Percentage	Count
Yes	83%	5
No	17%	1
Not sure	0%	0
Total	100%	6

How many activities/programs has your library implemented since the exhibit left your library? If you are not sure exactly how many, please enter your best guess. (All responses were estimates.)

	Minimum	Maximum	Mean	Count
How many activities/programs has your library implemented since the exhibit left your library? If you are not sure exactly how many, please enter your best guess.	3	137	32	5

What sources did you use for any exhibit-related programming you have done since the exhibit left your library? Check all that apply.

	Percentage	Count
STAR Net Community of Practice	24%	4
NASA Partners	24%	4
Other professionally created materials/programs	12%	2
Our own creation	24%	4
Volunteers	12%	2
Other; please describe:	6%	1
Total	100%	17

Who conducted the exhibit-related programs at your library? Please check all that apply.

	Percentage	Count
Library staff	45%	5
Outside partner(s)	36%	4
Volunteer(s)	18%	2
Other:	0%	0
Total	100%	11

Did your library partner/collaborate with exhibit-related organizations for program development and implementation? Please check all that apply.

	Percentage	Count
We did not partner or collaborate with an exhibit-related organization	0%	0
Science centers/museums	33%	5
Zoos/aquariums	7%	1
Universities/colleges	27%	4
Community colleges	13%	2
Research institutes – non-federal	7%	1
Research institutes – federal	0%	0
Other:	13%	2
Total	100%	15

Do you have any plans to organize or host any exhibit-related activities or programs at your library in the future?

	Percentage	Count
Yes	83%	5
No	0%	0
Not sure	17%	1
Total	100%	6

Please describe your plans to organize or host exhibit-related activities or programs at your library in the future.

- We will continue to offer a variety of STEM programs for a variety of ages.
- We are planning to host Space Fest again this year, as well as a program for the eclipse.
- We have already begun planning our Eclipse programming. We have contacted the Cradle of Aviation, The Amateur Observers, The Long Island Children's Museum, and a retired science teacher. We are working with an actor to create a program on Eclipses in Literature.
- We will be having additional space-related programs here, including one soon on meteorites. We will also be participating in the upcoming eclipse programs.
- We've had great luck with our International Observe the Moon nights. We are hoping to have the Northern CO Astronomical Society here more than once a year. We will continue STEM programming for school aged children.

In the six months since the exhibit left your library, have you noticed that patrons have asked for more exhibit-related activities or programs? Please select one.

	Percentage	Count
Yes, many patrons have asked for more exhibit-related activities/programs	37%	7
Yes, a few patrons have asked for more exhibit-related activities/programs	32%	6
No patrons have asked for more exhibit-related activities/programs	11%	2
Not sure if patrons have asked for more exhibit-related activities/programs	21%	4
Total	100%	19

What impact, if any, has the *Discover NASA* exhibit had on your library patrons?

- They want us to continue to bring similar exhibits to the community.
- It was treasured. Library patrons have expressed pride in our library/community for having had this exhibit, curiosity and interest in future exhibit possibilities, genuine interest and curiosity in STEM programs/materials, etc.
- It has had a very positive impact. Within the community I hear people talking about their experiences and many will mention an event we held and express the desire to repeat that event. Many wanted us to just "keep" the exhibit!
- It was a wonderful exhibit to have here, and I think those who took advantage of the displays, exhibits and interactive features really enjoyed it and learned a lot about NASA.
- They still come in and talk about it. They ask if/when we are going to get it back and if/when we will be doing more exhibits like it.

- Our patrons expect us to keep delivering new and exciting programs for our library. The patrons are very excited when they hear we will be getting new exhibits.
- They loved the shared community experience
- They loved it. Many hated to see it leave. They are waiting for the next exhibit.
- It increased awareness of NASA. We will continue to plan programs associated with NASA/space programming which we know will be of interest to our patrons.
- N/A - I do not work with patrons.
- Again, the patrons loved it and were sad to see it go. We had another smaller exhibit since and it reminded patrons of how cool then are.
- They seem to be expecting more hands-on items in the library.

Experiences (Pre and Post Survey Results)

Please report your level of knowledge about each of the following *Discover NASA* exhibit-related topics where 1 = Beginner and 5 = Expert. (n=14, matched pre-post responses only)

	Pre Mean	Post Mean	Percent of Change	Difference in Means (pre to Post)	Significant Difference*
NASA's broad mission	2.36	3.50	48%	+ 1.14	Yes (p=.002)
Earth science – our changing plant	2.57	3.00	17%	+ 0.43	No
The solar system and beyond	2.50	3.14	26%	+ 0.64	Yes (p=.033)
Human exploration – the International Space Station/astronauts	2.57	3.36	31%	+ 0.79	Yes (p=.015)
Aeronautics for now and the future	2.21	3.00	36%	+ 0.79	Yes (p=.028)
Mars exploration	2.71	3.14	16%	+ 0.43	No
Technology for now and the future	3.14	3.64	16%	+ 0.50	No

* Based on a matched-pair t-test (df=13)

We would like you to think about your current familiarity with STEM informal programming. Informal programming refers to activities and programs which are organized outside the regular school day setting (afterschool, on weekends, or during the summer). It includes activities/programs organized by libraries, afterschool organizations, museums, and other types of educational institutions. Please report your level of agreement with each of the following items related to informal STEM programming at your library.

Scale: Strongly Disagree to Strongly Agree

(n=14, matched pre-post responses only)

	Pre Mean	Post Mean	Percent of Change	Difference in Means (Pre to Post)	Significant Difference*
I am capable of generating new ideas for NASA/space science programs for my library	3.64	4.00	10%	+0.36	Yes (p=.019)
I am unsure about how to network with others to have them present their NASA/space science based programs at my library (note: Reverse scale)	2.36	2.36	0%	-	No

I am capable of implementing NASA/space science programs at my library that have been created by others	3.93	3.93	0%	-	No
I am confident I can implement my own ideas for NASA/space science programs at our library (n=13)	3.15	3.54	12%	+ 0.38	No
I understand NASA/space science concepts well enough to be effective in facilitating NASA/space science learning for my patrons	3.36	3.71	10%	+ 0.36	No
I wonder if I have the necessary skills to facilitate NASA/space science learning for my patrons	2.93	2.36	-19%	+ 0.57	No

* Based on a matched-pair t-test (df=13)

Implementing Activities Before the Exhibit (Pre-survey Only – All Respondents)

We'd like to know about your experience with implementing activities and programs for library patrons prior to the *Discover NASA* exhibit. Thinking about your experience at all the libraries where you have worked, please check the number of programs you personally have implemented for library patrons on any topic (not just about science, technology or engineering). (n=19) Pre-survey Only

	Count	Percentage
0 programs	1	5%
1 program	0	0%
2 to 3 programs	2	11%
4 to 5 programs	3	16%
6 or more programs	11	58%
Not sure	2	11%

We'd like to know about your experience with implementing science, technology or engineering programs prior to the *Discover NASA* exhibit. Thinking about your experience at all the libraries where you have worked, please check the number of programs you personally have implemented for library patrons about science, technology or engineering. (n = 19)

	Count	Percentage
0 programs	6	32%
1 program	1	5%
2 to 3 programs	3	16%
4 to 5 programs	2	11%
6 or more programs	7	37%
Not sure	0	0%

Training (Pre-survey Only – All Respondents)

We're interested in learning about any training you have received (through workshops, online webinars, university or college classes, etc.) to implement activities and programs for library patrons. Please check all that apply.

	Count	Percentage
I have not received any training on how to deliver activities and programs to library patrons (skip to next question)	3	16%
I received training as part of my regular degree program at my college/university	7	37%
I have received other training besides my regular degree program; please describe here:	14	74%
I'm not sure if I have received other training (skip to next question)	0	0%

I have received other training besides my regular degree program; please describe here:

- ALA book discussion training
- Coding workshops, makerspace workshops, technology related webinars, conference sessions...
- conferences, workshops
- discover earth training, I started a get your geek on technology program
- hands on training and observation of program implementation; oversee implementation of others' programs
- have viewed several webinars through Maine State library/WebJunction
- I have 10 years of experience as a YMCA program director. I have also been creating, developing, and facilitating Teen Programming at Slover since it opened in Jan 2015
- I have received some training offered by my current employer, Norfolk Public Library, and my previous employer, Virginia Beach Public Library
- Internal staff development training at NPL and professional development through Library IT user groups.
- NASA/MAVEN training, various conferences - CAL, CATS, CCIRA
- Various workshops through the AZ State Library
- webinars aimed at teen programming
- webinars provided by the Maine State Library
- workshops, webinars, hosting exhibits and special ALA program opportunities

Have you received any training specifically on STEM activities and programs for library patrons?

	Count	Percentage
Yes	9	47%
No	7	37%
Not sure	3	16%

Training (Pre- and Post-survey– All Respondents)

Which types of professional training/continuing education would you value the most? Please check all that apply. (Pre and Post-survey)

	Pre		Post	
	Count	Percentage	Count	Percentage
National library association meetings (e.g., ALA, PLA, ARSL)	4	21%	10	18%
State library association meetings	7	37%	11	19%
A national conference that brings together library and STEM professionals	8	42%	11	19%
Face-to-face training for a small group of people	14	74%	12	21%
Online webinars about relevant STEM learning topics	15	79%	12	21%
Other (Please specify): (pre) <ul style="list-style-type: none"> a lot more technology meetings 	1	5%	1	2%

Please think back to the training and support you received from the *Discover NASA* team when answering the next set of questions. Please report your level of agreement with each statement. (Post-survey Only)

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
In hindsight, the initial workshop prepared me to host the exhibit in my library n=15	0% (0)	0% (0)	7% (1)	27% (4)	67% (10)
The webinars helped prepare my library to facilitate exhibit-related programming n=11	0% (0)	0% (0)	36% (4)	36% (4)	27% (3)
The <i>Discover NASA</i> project training/resources/support prepared me to partner with other organizations to implement programming at my library n=14	0% (0)	0% (0)	7% (1)	71% (10)	21% (3)
I knew where to get support if needed as I implemented the exhibit in my library n=14	0% (0)	0% (0)	7% (1)	36% (5)	57% (8)

Please consider how your knowledge, interest, and confidence about STEM-based library programming has changed based on your experience with *Discover NASA*. Indicate your level of knowledge, interest, and confidence BEFORE the *Discover NASA* exhibit NOW (following the exhibit) in the following areas. (Post-survey Only)

	Before	Now (After)	Percent of Change
Your knowledge about how to develop and facilitate STEM-based library programming	2.7	3.7	37%
Your interest in developing and facilitating STEM-based library programming	3.6	4.1	14%
Your level of confidence about how to develop and facilitate STEM-based library programming	3.1	3.9	26%

What impact, if any, has being part of the *Discover NASA* project had on you? (Post-survey Only)

- I am much more interested in and tuned into NASA activities and discoveries. Due in part to our experience hosting *Discover NASA*, our library has been chosen to host a Smithsonian Water Ways exhibit in 2019.
- Major. It gave me perspective, appreciation for STEM professionals, it fed my curiosity, excited me about future projects. It was truly an honor and a privilege to be a part of this project.
- I learned so much! I have a deeper understanding of the complexity of the universe and our place within it. In many ways it has changed my view of the world. I am grateful that I, and my community had this opportunity! I find myself paying much more attention to what is happening around me in terms of science, space and the world, at large.
- I feel more confident about reaching out to help bring other large exhibits to our library.
- It was a great experience for me. The SSI team did a great job of making everything super easy and were always quick to respond whenever we needed help. Getting to work with the exhibit and accompanying programs also really boosted my own confidence in the creation and facilitation of STEM activities. Last but not least, though I have been a NASA fan for a while, it helped to rekindle my curiosity and support and give me a deeper understanding.
- It has been a great pleasure to be a part of this exhibit. We have come up with new and exciting tech-related projects like virtual reality that we shared with our community.
- I love it. It engaged me and stimulated my creativity in designing, developing, and initiating programming. I felt confident working with patrons at the exhibit stations, explaining how they worked and the concepts.
- It made my job a lot easier. Community members appreciated our bringing something like this to our area. Our funders sat up and took notice, too.
- As I am the Development Coordinator, my role was limited to writing the grant proposal.
- I knew a lot about NASA and the space program before this experience, but even I learned a lot about how much NASA affects everyday life for people all around the world.
- Good to know that I can coordinate a project of this size. Set up and tear down. Plan and present a series of programs in a short amount of time.
- The *Discover NASA* project gave me more tools to implement quality STEM programs at our library. It gave me a reason to partner with other community resources to bring quality programs to the library. It also helped to partner with schools and other educational entities - I had a very specific, high quality, interesting educational program to offer them.

Do you see a role for your library in encouraging STEM learning? (Post-survey Only)

	Percentage	Count
Yes	94%	17
No	0%	0
Not sure	6%	1
Total	100%	18

Please explain your answer. (Post-survey Only)

- We participate in AZ SciTech programs annually and host S.T.E.A.M. Time programs weekly for kids.
- We liken our role as "the grandparents of education." Important and meaningful spark/nurture/supplement developing thoughtful, curious people. STEM education is a priority to our library.
- Public libraries are a pillar of education for all. We have an opportunity and a responsibility to offer educational experiences for our communities. STEM learning is part of this and highly important for the continued development and health of our society, both intellectually and economically. -- FYI - Just last night we hosted a 3D printing class with a demo in partnership with our local college. The room was full of people of all ages wanting to understand the process. This is just one of many STEM activities we offer.

- Our library is currently undergoing a large STEM push, including a \$1M+ Maker Lab and new STEM-focused teen programming. STEM learning will be a large part of our library system's future.
- Libraries are in a unique position because they can offer STEM activities that focus on fostering wonder and curiosity. Unlike schools, they are under no mandate to cover an amount of material in any certain period of time.
- We have a ton of programs geared toward STEM learning. I mentioned the virtual reality, we have coding workshops and are always partnering with other STEM related organizations.
- We want to support and spark the students' desire to learn. No matter the age of the student, we want to encourage learning
- I believe that libraries can and should play a key role in supporting STEM learning. They are well-positioned to partner with their local schools and other experts.
- So many patrons enjoyed themselves. After the Exhibit was gone so many came to the Library looking for it.
- We are clearly a destination for supplemental STEAM/STEM learning. Patrons look for our STEAM/STEM based programming.
- We are part of a grant through our state library that will help us become a community science center.
- Including STEM programming fits our mission to "engage, enlighten, and enrich."
- Encouraging STEM learning has always been a goal of the library but seeing the response to the exhibit has only increased our desire to emphasize STEM in as much of our programming and activities as possible.
- We have had STEM programming in the past, present and are continuing to plan programs that are STEM based. NASA fit in really well with our vision.
- I think the library offers a chance for kids to explore STEM without having to worry about grades or coming up with the "right" answers. Also, they can pick and choose what programs interest them. We also help patrons find resources so that they can continue their exploring at home.

**Please share other comments or observations you have about the Discover NASA exhibit and/or project.
(Post-survey Only)**

- Thank you. Sincerely. THANK YOU for developing and sharing this exhibit with our library and community!
- I have been involved in working with exhibits and programs for nearly 25 years and this was the best exhibit we have ever had. It was so very well curated, easy to assemble and the support from your team was excellent. I believe it is vitally important for people in rural communities to have these experiences. It offers everyone the opportunity to grow a deeper understanding of concepts and activities that they are not exposed to often.
- I had a really great time with this exhibit! Thank you!
- From an IT perspective, the display should be designed with smaller components and maybe have a better set up instruction process.
- They are valuable as a teaching tool for everyone. Clearly, the exhibits are making STEM education more accessible. Once students are introduced to the possibilities of their succeeding in science, they are more likely to view science as a possibility in their futures. Also, think it is a boon to libraries in increasing their profiles and relevancy to their communities. The exhibits are expanding the mission of libraries and how people look at libraries.
- Loved it!
- I actually was not very involved in the exhibit!
- Great experience!
- I can't say enough about the high quality and ease of maintenance of the equipment sent to the library. Also, the facilitators of the trainings were very helpful and knowledgeable. They went out of their way to help out and even did some of our programs!

STAR Net CoP website (Pre- and Post-survey– All Respondents)

Do you participate in any “communities of practice” other than the *STAR Net* community of practice? A community of practice is a group of people who share a concern or a passion for something they do, and learn how to do it better as they interact regularly. (Pre-survey Only)

	Count	Percentage
Yes (Please specify):	4	21%
No	11	58%
Not sure	4	21%

Yes (Please specify):

- Embroiderers' Guild of America, Book Discussion Groups
- IEEE Computer Society, ACM, Techsoup Forum
- Norfolk Prevention Network
- Verde Valley SciTech Committee, Verde Valley Librarians

Have you looked at the *STAR Net* CoP website? (Post-survey Only)

	Percentage	Count
Yes	74%	14
No	21%	4
Not Sure	5%	1
Total	100%	19

How frequently have you gone to the *STAR Net* CoP website in the past year? (Post-survey Only)

	Percentage	Count
1-2 times in total	29%	4
About every other month	43%	6
About once or twice per month	7%	1
About once a week	0%	0
More than once a week	0%	0
Not sure	0%	0
Other; please describe:	21%	3
Total	100%	14

Some of the features of the *STAR Net* CoP website are listed below. Please indicate how useful you have found each CoP feature. For features you haven't used, please check “Haven't used yet.” (Post-survey Only)

	Haven't used yet	Not at all useful	Not very useful	Useful	Very useful
Networking with other library staff (n=12)	33% 4	0% 0	0% 0	50% 6	17% 2
Networking with science professionals (n=13)	31% 4	0% 0	15% 2	31% 4	23% 3
Participating in science discussion groups (n=12)	33% 4	0% 0	0% 0	50% 6	17% 2
Learning about best practices in science education (n=12)	17% 2	0% 0	8% 1	42% 5	33% 4

Sharing my best practices about science education (n=12)	42% 5	0% 0	8% 1	50% 6	0% 0
Webinars (n=12)	25% 3	0% 0	0% 0	8% 1	67% 8
Exhibit-specific resources/support (n=12)	8% 1	0% 0	8% 1	17% 2	67% 8

Please share any recommendations you have for ways to improve the STAR Net CoP website. (Post-survey Only)

- I don't have any ideas to share
- n/a -- a personal improvement would be for me to better utilize it!
- Organization could be better
- The website seems a bit too convoluted and unintuitive.
- Make it easier to navigate. I still find it difficult.

If your recommendations were implemented, do you think you would visit the STAR Net CoP website more frequently? (Post-survey Only)

	Percentage	Count
Yes	36%	5
No	7%	1
Not sure	57%	8
Total	100%	14