STAR Net Phase 2 Summative Evaluation Report

PREPARED FOR

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Contents

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Introduction

The STAR Library Network Phase 2 (*STAR Net*) brings inquiry-based STEM[1] learning experiences to public libraries through six traveling exhibits, training for library staff and associated programming for library patrons, and an online community of practice for library staff and others who are interested in bringing STEM programming to libraries. Education Development Center (EDC) conducted the summative evaluation of the second phase of *STAR Net* (which stand for the **S**cience-**T**echnology, **A**ctivities and **R**esources Library **Net**work). This report summarizes the findings from all four years of the project (2014-2018) regarding the impact of the exhibits and accompanying project activities on host librarians and their patrons.

Project Description

In 2014, the National Center for Interactive Learning (NCIL) at the Space Science Institute (SSI) was awarded a four-year NSF grant to develop a hands-on learning program for libraries and their communities. As articulated in the proposal to NSF, *STAR Net* Phase 2 has the following goals:

1. **Increase youth and adult patrons' interest, knowledge, and engagement in STEM topics** through innovative exhibits, programming, and resources with a particular focus on the vital role that STEM plays in our everyday lives.
2. **Increase STEM program participation at libraries in communities with populations underserved and underrepresented in STEM**.
3. **Build the capacity of libraries and library staff nationwide** to deliver inspirational and effective STEM learning experiences for their communities.
4. **Increase the interest and ability of libraries to partner with a variety of STEM professionals and educators** (local, regional, and national) to establish effective, on-going STEM programs.
5. **Advance the informal education field by** 1) building a deeper understanding of how libraries can become a conduit for STEM delivery to underserved populations, 2) generating a foundational study of STEM learning in public libraries using the museum-based contextual model of free-choice learning**,** and 3) broadly disseminating lessons learned from the project.

STAR Net is a partnership between NCIL and the American Library Association (ALA), the Lunar and Planetary Institute (LPI), Afterschool Alliance (AA), and Datum (research lead organization).

NCIL managed the entire project and led the development of six STEM-based traveling exhibits for public libraries. Two of these exhibits—*Discover Earth: A Century of Change* and *Discover Tech: Engineers Make a World of Difference*—were developed in the first phase of *STAR Net*, which was implemented from 2010-2013. In Phase 2, NCIL developed a third exhibit, *Discover Space: A Cosmic Journey*, and also created scaled-down versions of all three *Discover* exhibits called *Explore*. Each *Discover* exhibit has multiple double-sided display panels, five interactive computer kiosks, and other interactive hands-on activities. The smaller *Explore* exhibits each include double-sided panels, one computer kiosk, and hands-on materials for a *Discover* Station.

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

ALA promoted the project through its network of libraries, led the library selection process, coordinated exhibit scheduling and transportation between the host libraries, and established a reporting system that host libraries used to document required program activities, participant demographics, publicity, and photographs. A total of 66 libraries from across the United States were selected to host one of the exhibits. Eight public libraries each were selected to receive either the *Discover Earth*, *Discover Tech,* or *Discover Space* exhibit, while 14 public libraries each were selected to receive the smaller *Explore Earth*, *Explore Tech*, or *Explore Space* exhibit. Each of the 24 *Discover* libraries hosted the exhibition for approximately three months, while the *Explore* sites hosted the exhibits for two months each. All the libraries were awarded grants of $1,000 to support public programs related to the exhibits.

Two staff (a project director and a project coordinator) from each *Discover* library attended a two-day, in-person training (held in 2015/2016) during which they learned about the set-up/take down and content of their exhibit, as well as associated programming and other resources. LPI, and later NCIL,[2] developed and piloted hands-on activities related to the content of each of the exhibits for school-age children, and trained library staff in how to implement these activities during the in-person trainings and online webinars (which were also open to libraries that were not hosting the exhibit).

Staff from *Explore* exhibits did not receive training in person. Rather, they were invited to attend a kick-off webinar that welcomed them to the project, gave an overview of *STAR Net*, and reviewed the expectations for programming, evaluation, and reporting.

The Afterschool Alliance helped connect libraries hosting the exhibit to afterschool programming resources, and developed case studies highlighting successful STEM programming implemented at some of the *Discover* and *Explore* host libraries. They also promoted library partnerships as part of their annual *Lights On Afterschool* celebration.

Datum conducted research associated with the *STAR Net* effort focused on understanding what factors contribute to libraries' ability and readiness to offer STEM programming.

Evaluation Overview

EDC conducted the *STAR Net* Phase 2 evaluation. EDC helped the *STAR Net* team revise the Phase 1 logic model describing *STAR Net*'s activities and outcomes (see Appendix A). The following evaluation guiding questions were developed regarding the implementation and impact of the exhibits and accompanying project activities on the host librarians[3] and patrons:

1. Does the professional development delivered by *STAR Net* Phase 2 help host library staff deliver high quality informal science education programming (including LPI activities)?
2. To what extent (and how) do Phase 2 project team members, public library staff, and STEM professionals and educators develop partnerships to provide STEM programming for youth and adults?

[2] The Co-PI from LPI relocated to NCIL in early 2016 and continued to lead *STAR Net*'s professional development efforts.

[3] "Librarians" and "library staff" are used interchangeably throughout this report, although technically, not all library staff members are librarians.

3. To what extent (and how) are the *STAR Net* Phase 2 exhibits and programming effective in reaching underserved library populations?
4. To what extent do library patrons at the Phase 2 host libraries become more interested in, knowledgeable about, and engaged in the STEM topics presented in the exhibits and related programming?
5. Are there differences in librarian and patron outcomes at libraries that receive the small *Explore* exhibits versus the large *Discover* exhibits?
6. What, if any, are the unanticipated consequences of *STAR Net* Phase 2 (positive or negative) on librarians, libraries, patrons, and others?

The evaluation utilized mixed methods to investigate the implementation of the project and its outcomes, and to answer the evaluation questions. Institutional Review Board approval was received for the evaluation plan and instruments before data collection began. EDC administered pre- and post-exhibit surveys to library staff who hosted the exhibits; collected patron surveys and circulation records; conducted site visits to 12 host libraries (which included interviews and observations of/with library staff and library patrons); and reviewed ALA exhibit reports. Table 1 shows the data collection instruments and when they were administered. A detailed description of the evaluation methodology can be found in Appendix B.

Table 1. *STAR Net* Summative Evaluation Instruments and Timeline for Administration

Instrument	When Administered
Discover Earth, Discover Tech, and *Discover Space* Training Satisfaction Surveys	*Discover Earth* September 2015 *Discover Tech* November 2015 *Discover Space* February 2016
Librarian Pre-Exhibit Survey	January 2016
Librarian Six Month Post-Exhibit Survey	Six months after exhibit left each library
Library Patron Survey	While exhibit was at each library
Site visits to a total of 12 libraries hosting one of the *STAR Net* exhibits to observe patrons interact with exhibit, interview library patrons, interview library staff, and observe library staff conduct exhibit programming	May 2016 – March 2018
ALA Final Report Form	Immediately after exhibit left each library
Exhibit-related circulation records	Immediately after exhibit left each library and again one year later (if applicable)

Findings by Evaluation Question

This report is organized around the guiding evaluation questions. Results from all relevant data sources are presented together for each question. The six overarching evaluation questions are shown in boxes like the one on the following page for Question 1. Program indicators that relate to each evaluation question are shown in smaller yellow boxes are marked with a "✓."

Question 1: Does the professional development delivered by *STAR Net* Phase 2 help host library staff deliver high quality informal science education programming (including LPI activities)?

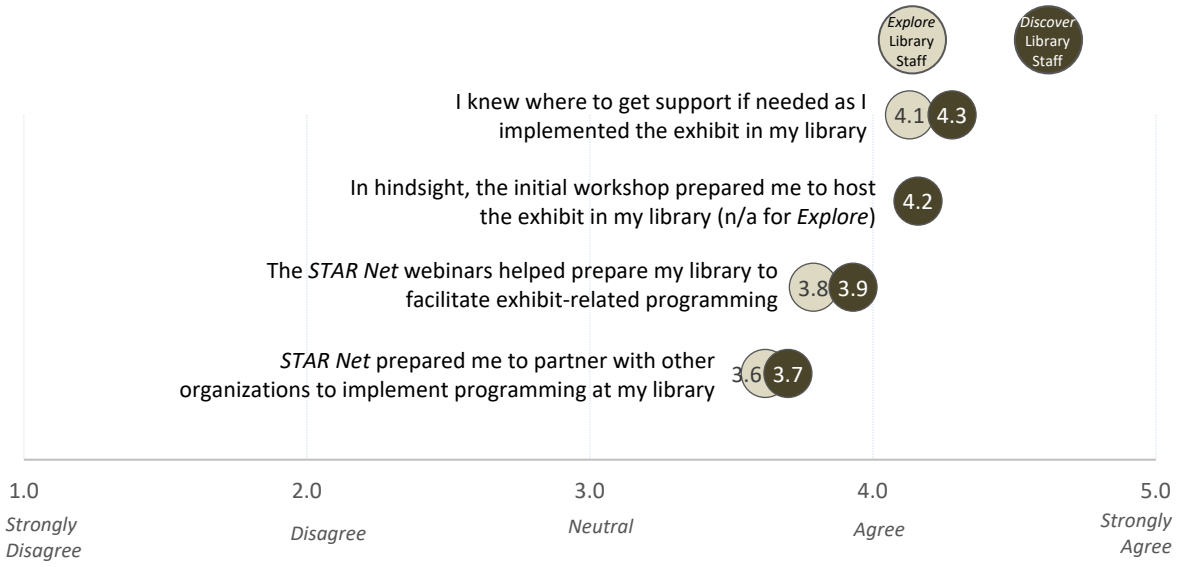
Preparation

The *STAR Net* project team provided professional development (PD) to library staff who applied for and received the exhibits. The PD was delivered in multiple formats; the format and depth of the PD varied depending on whether host libraries received a larger *Discover* exhibit or a smaller *Explore* exhibit.

Discover libraries participated in a two-day, in-person training during which library staff learned about the contents of the exhibit as well as how to set it up and take it down. (Separate trainings were held for *Discover Earth*, *Discover Tech* and *Discover Space* in September 2015, November 2015, and February 2016, respectively.) Participants were also introduced to pre-made programs and activities for school-age children, and learned about other resources for developing exhibit-related programming. Participants were able to meet and talk with the *STAR Net* project team, and network with staff from other libraries that would be hosting the same exhibit.

Explore libraries did not receive in-person training. Rather, all the *Explore* libraries were invited to attend a kick-off webinar in January 2016 that welcomed them to the project, gave an overview of *STAR Net*, and reviewed the expectations for programming, evaluation, and reporting.

Figure 1. Library staff hosting *Explore* and *Discover* exhibits generally indicated that the training and support that they received prepared them to host the exhibits and implement exhibit-related programming.



Source: Library Staff Six Month Post-Exhibit Surveys; n = 45 *Explore* respondents and n = 30 *Discover* respondents

In addition, all *Discover* and *Explore* libraries received a resource notebook, were invited to attend follow-up webinars related to programming, and were encouraged to participate in an online Community of Practice (CoP). The webinars and CoP were open to library staff from libraries that were not hosting the exhibits, as well as other participants interested in implementing STEM in public libraries.

The *STAR Net* project team created a Teacher Guide and a Parent Guide and made them available for libraries to use however they wished. On the Library Staff Six Month Post-Exhibit Survey, just over half the respondents (56%) from *Discover* libraries said their library had used the *STAR Net* Teacher Guide while hosting the exhibit, while 37% of the *Explore* post-survey respondents reported doing so. In response to an open-ended question asking how they had used the Teacher Guide, library staff most commonly reported that they distributed it to teachers and/or principals to publicize the exhibit—usually electronically but occasionally during in-person visits to schools. About a third of the library staff who used the guide reported they used it internally to guide the design of their own programs. About a quarter of the librarians gave copies of the guide to teachers who were bringing children on a field trip to the library. Two libraries posted the Teacher Guide on their websites. Selected examples of how librarians reported using the Teacher Guide include:

- "I generated and distributed a Teacher Guide PDF by e-mail to the local school district teachers. I made copies for the teachers of the two local schools that visited the exhibition. I thought the guide would be useful and helpful for the teachers to use at the exhibition or in the classroom."
- "We sent out print copies to all the area teachers to promote the exhibit. It was nice to have something already put together and ready to distribute to our community."
- "We made up packets for each of the school systems in [our county] and surrounding counties that included the Teacher Guide. We also included the guide in local school visits and sent it by email to teachers when they booked a classroom visit."
- "We set up meetings with teachers at local schools, prior to the exhibit opening and afterward; we gave the teachers copies of the guide at these meetings. We also sent emails, with the guide as an attachment, to teachers that we couldn't reach in the meetings."
- "We sent it to teachers prior to their class' field trip to the exhibit."
- "We sent out packets to area schools and then went in again and encouraged teachers to sign up for field trips. We also had them out during the exhibit and linked it online on the website we created for *Discover Tech*."
- "The Teacher Guide was used as a starting point for planning programs like the Mad Science Mondays; every week children conducted different experiments."
- "The Teacher Guide was given to each elementary school principal—with very limited success. However, our staff used the guide for ideas and to help plan programs to engage children."
- "I used the Teacher Guide to help me with the three programs that we hosted. We used the Teacher Guide and videos to help with the wind turbine tech challenge, the design a park program and the water filtration program. They were so helpful in understanding how the engineering and creation of the crafts would work."

One third of the *Discover* respondents (33%) and one quarter of the *Explore* respondents (26%) said their library had used the *STAR Net* Parent Guide while hosting the exhibit. Library staff who reported utilizing the guide most commonly said they made copies of it available for families to pick up while in the library, or distributed it during programs for families. Two librarians said they promoted it specifically to parents who were homeschooling their children. Two libraries posted the Parent Guide on their websites. One librarian

mentioned using the Family Guide to inspire the library's programming. Selected examples of how librarians reported using the Parent Guide include:

- "We used the guide as a hand out for families that visited the library. We also posted it on our website."
- "Parents were given instructions about the use the information in the guide. Examples were done to further enhance their understanding. I think the Parent Guide helped to simplify the activities which kept parents and children pretty much engaged in the activities."
- "We printed a Parent Guide and left them available to parents/children attending."
- "We made these materials available to homeschooling families in our children's area. We also used these materials when creating programs geared toward families."

For most Phase 2 participants, *STAR Net* was the first time they had received training specifically about implementing STEM-based programs. Less than half the survey respondents (40%) indicated they had previously received training focused on implementing STEM activities and programs for library patrons. (In Phase 1 of *STAR Net*, only 15% of *STAR Net* directors and coordinators reported that they had previously received training regarding STEM-based programming.)

In interviews, most library staff reported they felt prepared to implement informal science programming for the exhibits. They appreciated that they were a variety of resources available to them to refer to, especially as it came closer to the time their library would receive an exhibit.

In fact, one of *STAR Net*'s challenges is that the exhibits rotated from one library to another over a three-year period, so many libraries experienced a lag between when they received training and when they received the exhibit. Several *Discover* and *Explore* library staff who hosted an exhibit more than a year after they attended the initial in-person *Discover* training or kick-off *Explore* webinar said that it was challenging to recall what they had learned. One librarian said, "The training was great but there was way too long a period in between to remember what happened." Another said, "The training was 18 months ago…It's been so long ago that some of it kind of left." Librarians used various strategies to fill the gaps, including referring to the handbook, contacting libraries that were hosting the same exhibit before them, and viewing archived versions of *STAR Net* webinars. One library staff said, "We attended different webinars and found them helpful. It's always better when you can be in the room with someone, [but] I really like that fact that *STAR Net* has the archives and we can download them later."

A number of library staff said they found the *STAR Net* project team to be responsive, helpful, and enthusiastic. For example:

- "I have been blown away with the follow-up support. The webinars and newsletters are extremely helpful—packed with useful information about programming, ideas, partners and grants. If these had not been offered, I would not have done nearly as much post-exhibit STEM programming. Even though I was fired up about STEM, the webinars, newsletters and *STAR Net* resources kept me engaged."
- "I was not the originator of this project. I had not attended any of the training for it. It seemed daunting when I first learned I was taking it on, and with a new staff to boot. BUT...There was a lot of support from the many organizations involved and even from the library that housed the exhibit before us. And even from the trucking company that delivered the exhibit! We felt very supported even before the first crate arrived. It was nice to feel that we weren't alone, and that we could reach out at any time with questions. Thanks to everyone who made this project happen!"

- "Really great people at *STAR Net*. Very enthusiastic and knowledgeable. It was a privilege to work with them and to host the exhibit."

While the majority of library staff said they felt the project team was responsive to their questions and requests for follow-up assistance, a few library staff said they were disappointed they had not received more resources prior to getting the exhibit (including already developed publicity materials and a physical copy of the handbook), or indicated they had difficulty getting timely support from the *STAR Net* project team to address equipment-related challenges. In addition, a few library staff from *Explore* exhibits said the majority of the documents on the *STAR Net* online Community of Practice (CoP) were labelled '*Discover*,' and it was sometimes difficult to discern which materials were relevant to *Explore*. Librarians' comments included:

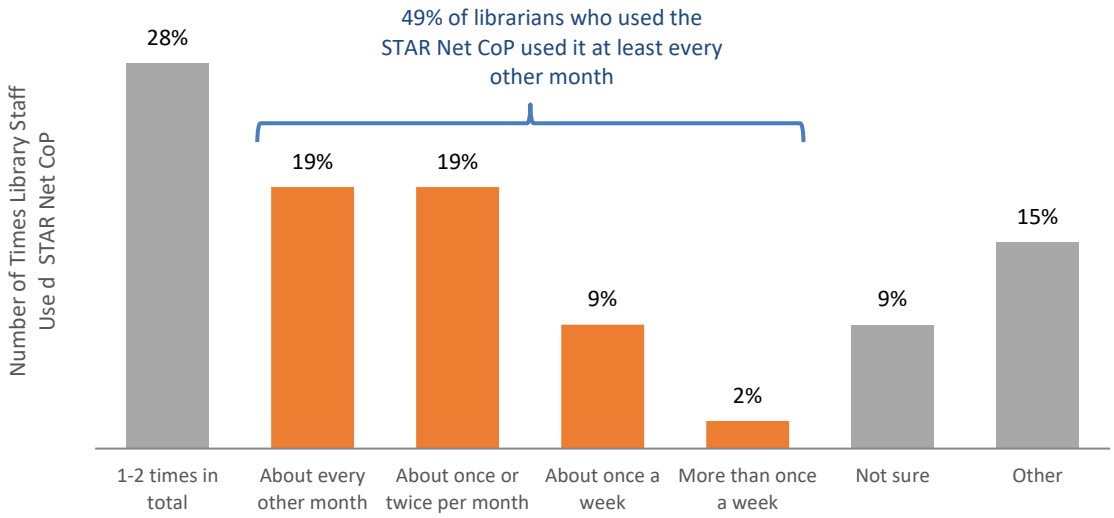
- "I was a little surprised since this is targeted to smaller libraries that there weren't already pre-made posters. I'm fine putting together something like that (part of my job). But if going to any smaller libraries than our library, would be skill set that they might not have. Could say something like '*Explore Tech* is here,' and have a space where could put information about programs."
- "I had trouble finding a lot of stuff that should have been in handbook and is not. It's been so long since we got the grant. We received the information by email two years ago. I know there's an evaluation form, but where is that? It would have been really great to have [a physical copy of the] handbook in advance—six months to year ahead. I could find it online, but it's hard to read online."

✓ **Indicator:** *STAR Net* Host Librarians share information and strategies, and answer and ask questions on the online CoP

The *STAR Net* project hosted an online community of practice in order to help project librarians communicate and collaborate with STEM professionals and others (http://www.starnetlibraries.org). The *STAR Net* CoP has features that allow members to exchange information and find ideas, resources, activities, and news/blog items contributed by CoP members and project partners. Members can also download archived webinars and communicate with other CoP members, who include librarians, museum educators, teachers, scientists, engineers, and other STEM professionals.

The Six-Month Follow-up Survey asked librarians if they had looked at the *STAR Net* CoP. About two thirds of the library staff (62%) who completed the survey reported "Yes." The remaining librarians reported "No" or that they were "Not sure." Of the library staff who reported that they had used the CoP site, about half (49%) indicated they had used it several times over the past year (see Figure 2). Another 28% had used it only once or twice in the past year.

Figure 2. About half the host libraries who reported using the *STAR Net* CoP indicated they had used it several times over the past year (at least every other month).



Source: Library Staff Six Month Post-Exhibit Surveys; n = 54 respondents

The ALA Final Report Form asked directors to describe programs their library had offered during the exhibit. Of the 540 programs offered by 60 libraries, 6% (32 programs) used the *STAR Net* online CoP as a resource for finding those programs. (However, on the follow-up survey administered to library staff six months after they had hosted the exhibit, a much higher percentage of library directors reported using the online CoP as a source for programming: 43%. Information about programming libraries implemented after the exhibit left their library is described later in this section, under "Sustainability.")

A total of 54 respondents to the Six-Month Post-Exhibit Survey reported using the CoP. Librarians were asked to identify which CoP features they had used and how useful each feature was. Features that were used more often were also reported more useful. The most frequently used aspect of the CoP site was the "Exhibit-specific resources/support," which 93% of CoP users had accessed. This feature also had the highest usefulness rating, with 69% of CoP users saying exhibit-specific resources were "Very useful" (see Table 2).

Table 2. Of the various features availble on the *STAR Net* CoP, library staff indicated that the exhibit-specific resources/support and webinars were the most useful.

Respondents used the following scale: 1 = Not at all useful; 2 = Not very useful; 3 = Neutral; 4 = Useful; 5 = Very useful

***STAR Net* CoP Features**	**Count**	**Haven't used yet**	**Gave maximum rating of "Very useful"**
Exhibit-specific resources/support	54	7%	69%
Webinars	53	15%	57%
Learning about best practices in science [technology] [space] education	54	20%	41%
Networking with science [technology] [space] professionals	52	46%	19%
Networking with other library staff	53	42%	17%
Participating in science [technology] [space] discussion groups	53	47%	17%
Sharing my best practices about science [technology] [space] education	52	44%	10%

Source: Library Staff Six-Month Post-Exhibit Surveys; n = 54 respondents

When asked to share recommendations for improving the CoP, the majority of respondents either left the question blank or said that they did not have any suggestions. Responses included:

- "I love the improvements to the look of the website. I use it frequently. Not sure how to change it to make it better!"
- "Just keep adding, keep it current and relevant! It is such a great asset."
- "It is outstanding and a wonderful resource whether there is a current grant or exhibit or not."
- "I don't have many recommendations to make. The site is very easy to navigate and has lots of great features. I'm more drawn to the programming guides and videos because I use those most frequently."
- "From my limited use of the website I have no recommendations. I have found it easy to maneuver and helpful."

Librarians provided the following recommendations for improving the CoP site on the Six-Month Post-Exhibit Survey.

- "Encourage more participation."
- "I would benefit from having a reminder e-mail that would highlight a specific topic or new content."
- "I'd like to see regional groups on the *STAR Net* CoP site."

Some library staff indicated the site was hard to navigate. They were most likely referring to the iMeet site which was accessible only to the host libraries and which was used for storing project-specific documents and communication. Library staff who offered critical feedback said:

- "[I had] difficulty in locating the *Explore* Exhibits. *Discover* Exhibits were featured more prominently."
- "Often, the resources I needed either weren't there, or they were out of date. The current versions of exhibit resources were not well marked, which was very confusing. I understand that the exhibit developers were responsible for multiple exhibits in various stages of development, but it felt as though once they has 'some' info out about our exhibit, they moved on to the next one and we were left hanging when we had questions."
- "The site itself isn't the easiest to navigate. I would prefer an email component open to library staff participating in specific exhibits, to share and learn from each other. We were fortunate enough to visit a library only two hours from us when the exhibit was there. We spoke with the staff about challenges and successes and learned so many ideas from them. They were happy to share a number of passive program ideas with us. If there were a Facebook group or other, more manageable way for exhibit libraries to communicate with each other and share resources, it would be extremely helpful."
- "Possibly not have the first page be the Activity Feed but maybe a page with links only to choose where to go. When I first logged in the only thing I saw initially was the Activity feed and then I didn't really know where to go from there..."
- "I found the site difficult to navigate or to find pertinent information."

Some library staff may have been confused about the purposes of the *STAR Net* CoP, the internal iMeet site, and the STEM Clearinghouse (which *STAR Net* also manages and which has sample programs). One library staff wrote:

> "Mostly I just had some confusion about where to access different resources. It seemed like resources were spread out on different websites, and I wasn't always clear where I needed to be looking for different resources. (This [comment] isn't so much about the website but about communication regarding the exhibit)."

Of the respondents who answered the question "If your recommendations were implemented, do you think you would visit the *STAR Net* CoP website more frequently?" the majority (74%) said they were "Not sure." A smaller percentage (22%) said "Yes." Three respondents (4%) said that even if their recommendations were implemented, they would not visit the CoP more often.

✓ **Indicator:** *STAR Net* Host Librarians indicate that *STAR Net* training and resources increased their knowledge of the earth science, engineering/technology, or space topics

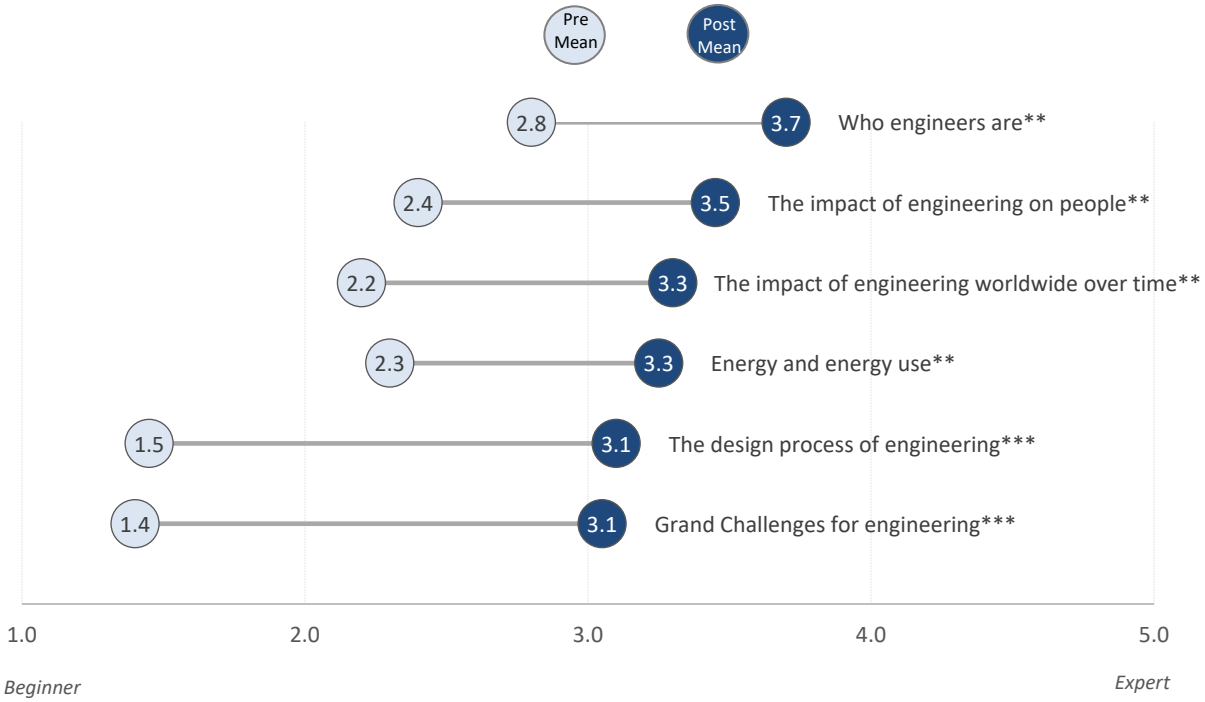
Librarians from all the exhibits increased their self-reported knowledge about exhibit-related topics six months after they had hosted the exhibit, with *Discover* and *Explore Tech* librarians demonstrating both the greatest gains and the highest post-*STAR Net* knowledge compared to librarians hosting *Earth* or *Space* exhibits.

Project directors and coordinators from each library were asked to report their level of knowledge about either earth science, engineering, or space-related topics (depending on which exhibit they hosted) before the exhibit came to their library and again six months after the exhibit left their library. Library staff rated

themselves on each topic on a scale of 1 = Beginner to 5 = Expert. Only those library staff who completed both the pre- and post- survey were included in the analysis shown in Figures 3-5 on the following pages.

Librarians from all three topics increased their exhibit-related knowledge, although *Tech* librarians demonstrated greater gains than either *Earth* or *Space* librarians. On average, *Tech* librarians increased their knowledge 1.11 points (to an average of 3.31 on the five-point scale six months after they had hosted the exhibit), while *Earth* librarians increased their knowledge 0.65 points (to an average of 3.27 six months after they had hosted the exhibit) and *Space* librarians increased their knowledge 0.80 (to an average of 2.83 six months after they hosted the exhibit). Almost all of the mean pre-post increases were statistically significant (significant differences are marked with asterisks on the charts below).[4] Of the three STEM topics, librarians reported having the least knowledge of space after they participated in *STAR Net*, and the most regarding earth science.

Figure 3. *Discover Tech* and *Explore Tech* library staff increased their knowledge of engineering and topics.

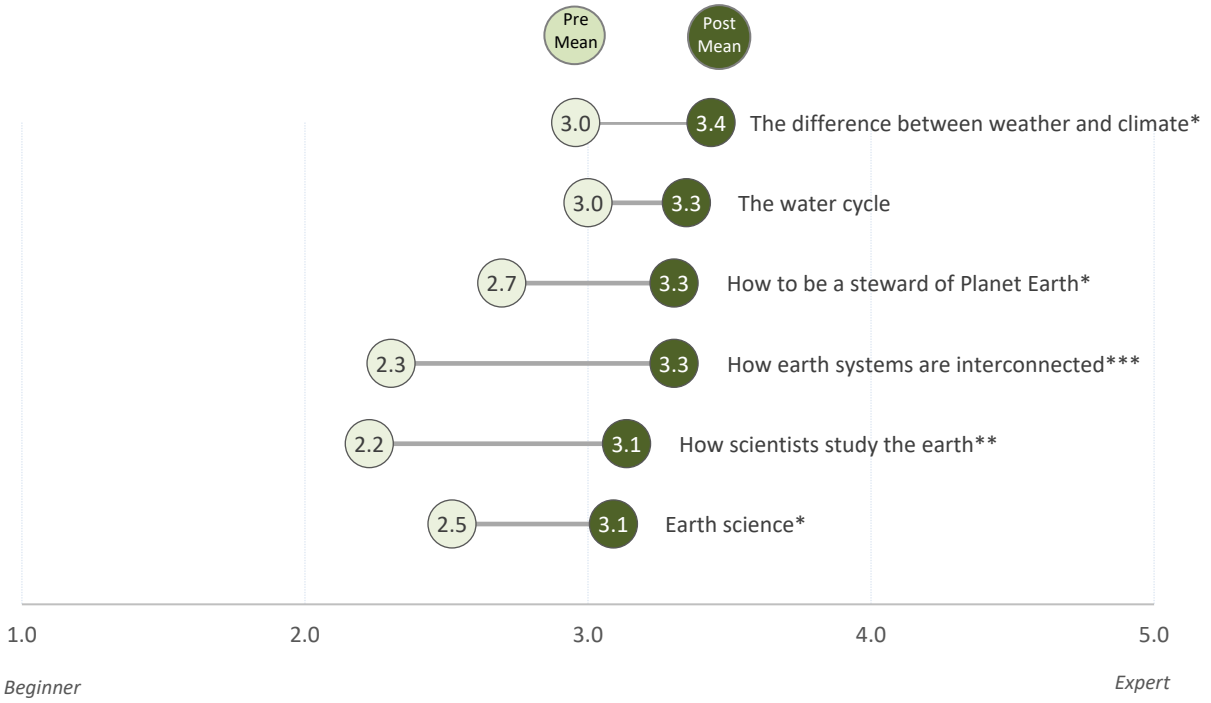


Source: Matched Library Staff Pre-Exhibit and Six-Month Post-Exhibit Surveys; n = 20
Paired t-test comparing pre- and post-means significantly different: **p < .01; *** p <.001

[4] p < .05 is an example of a "p-value." Researchers and evaluators use p-values to help them decide whether apparent differences might simply be due to chance. In technical terms, a "p-value" indicates the likelihood that a measured value could occur just by chance, assuming that the null hypothesis is true. (In this case, the "null hypothesis" is that *STAR Net* has no impact on librarians' knowledge.) In simpler terms, a p-value indicates the likelihood that an apparent difference in librarians' pre- to post-knowledge is actually just due to chance (assuming that the project did not actually have any impact on librarians' knowledge).

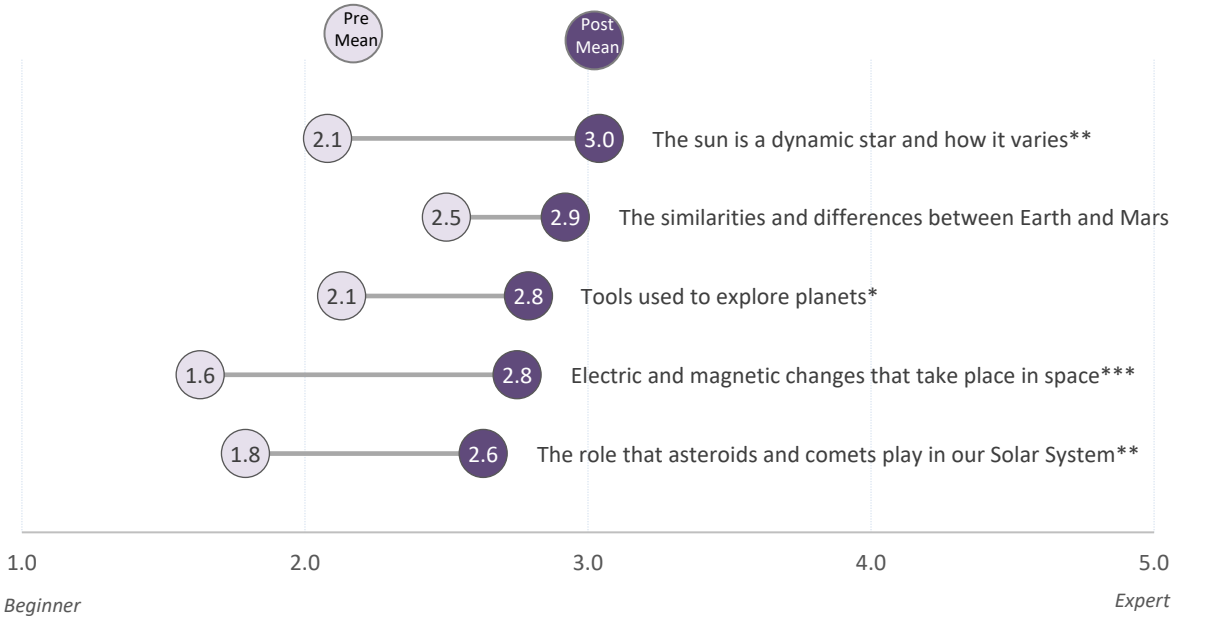
A p-value of less than .05 means that you might expect a similarly extreme result five times out of 100 when there is no relationship between the project and the measured outcome. A p-value of less than .01 means that there is less than one chance in 100 that the measurement is due to chance. P-values of less than .05 are generally considered to be "statistically significant," that is, sufficiently unlikely to have occurred due to chance that it is reasonable to reject the null hypothesis.

Figure 4. *Discover Earth* and *Explore Earth* library staff increased their knowledge of earth science topics.



Source: Matched Library Staff Pre-Exhibit and Six Month Post-Exhibit Surveys; n = 23
Paired t-test comparing pre- and post-means significantly different: *p < .05; **p < .01; *** p <.001

Figure 5. *Discover Space* and *Explore Space* library staff increased their knowledge of engineering and topics.



Source: Matched Library Staff Pre-Exhibit and Six Month Post-Exhibit Surveys; n = 24
Paired t-test comparing pre- and post-means significantly different: p < .05 **p < .01; *** p <.001

In interviews and in response to open-ended questions on the Six Month Post-Exhibit Survey, several library staff said they felt the *STAR Net* training and resources increased their knowledge of the earth science, engineering, or space topics. Library staff commented:

- "I've met so many people with like interests and learned so much from my interactions with all of them. I've definitely learned more about our earth and feel that we did a really good job of sharing this with our community and surrounding areas."
- "I think the *Discover Space* Quiz Show and humorous version of a TV game show, Eyes on Exoplanets touchscreen kiosk, Mission to Mars, Space Rocks, and Solar System Weather Report Station were the most interesting parts of the exhibit. Those kiosks exposed me to a new world of information regarding our solar system and environment."
- "I certainly learned more about space and astronomy after *STAR Net*'s presence here."
- "I learned about the importance of earth science and how to implement it in the library."

✓ **Indicator:** *STAR Net* Host Librarians increased their knowledge and confidence about how to develop and facilitate STEM-based library programming

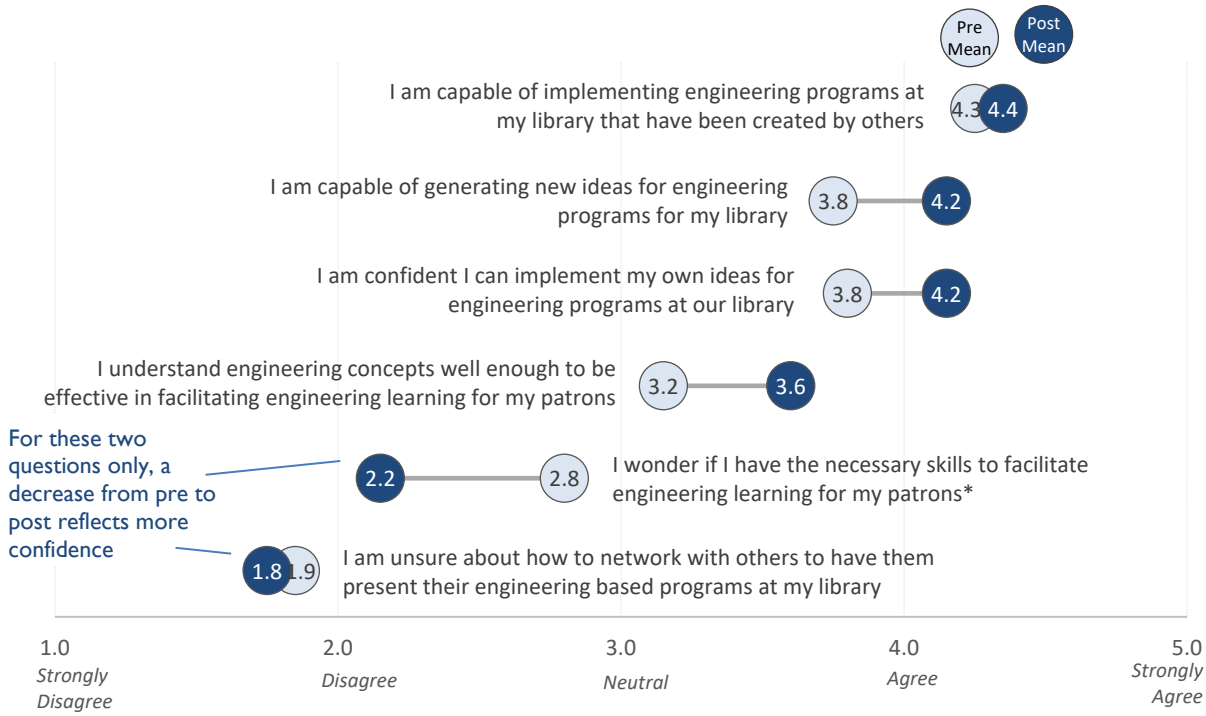
Another expected outcome of the project was that library staff would increase their interest, knowledge, and skill in facilitating informal science education activities related to earth science, engineering and technology, or space. Many host library staff became more interested in developing and delivering STEM-based library programming as a result of their involvement in *STAR Net*, became more knowledgeable about how to create and deliver such programs, and more confident in their abilities to deliver informal science programs effectively.

The evaluation team gathered pre- and post-data using a series of survey questions regarding librarians' familiarity and confidence with implementing informal STEM programming. Librarians indicated their agreement with each topic on a scale where 1 = Strongly Disagree to 5 = Strongly Agree.

Pre/post survey results regarding librarian's confidence with informal science programming were mixed (see Figures 6-8 on the following pages). While *Tech* and *Earth* librarians' confidence scores improved slightly, *Space* librarians' confidence scores actually worsened slightly. However, none of these increases or decreases was statistically significant. On most items, *Tech* librarians' average scores improved slightly from pre- to post- (increasing from an average of 3.38 to an average of 3.78 across all six questions[5]), as did *Earth* librarians' average scores (increasing from an average of 3.73 to an average of 3.77). In contrast, *Space* librarians' average scores declined slightly from pre- to post- on most items (decreasing from an average of 3.41 to an average of 3.36).

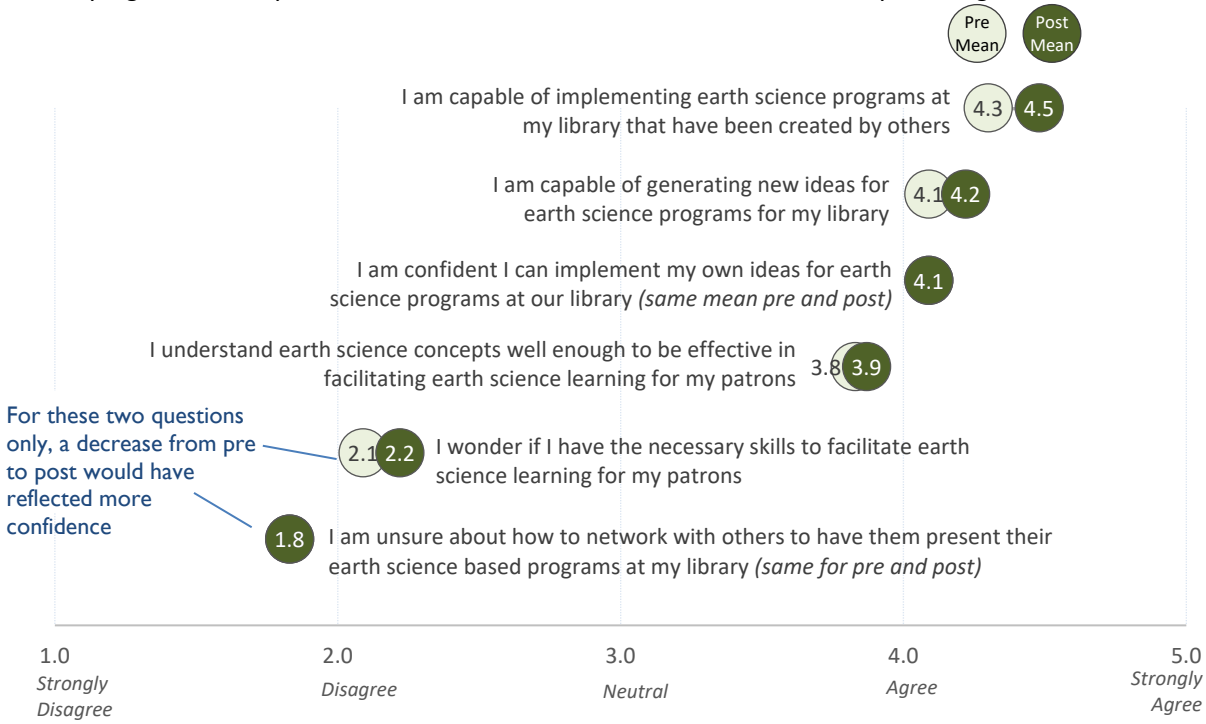
[5] The last two questions of the scale were asked negatively, and were reverse coded when calculating the overall scale mean so as to be consistent with the other four questions.

Figure 6. *Discover Tech* and *Explore Tech* library staff became slightly more confident about implementing engineering programming after they participated in *STAR Net*.



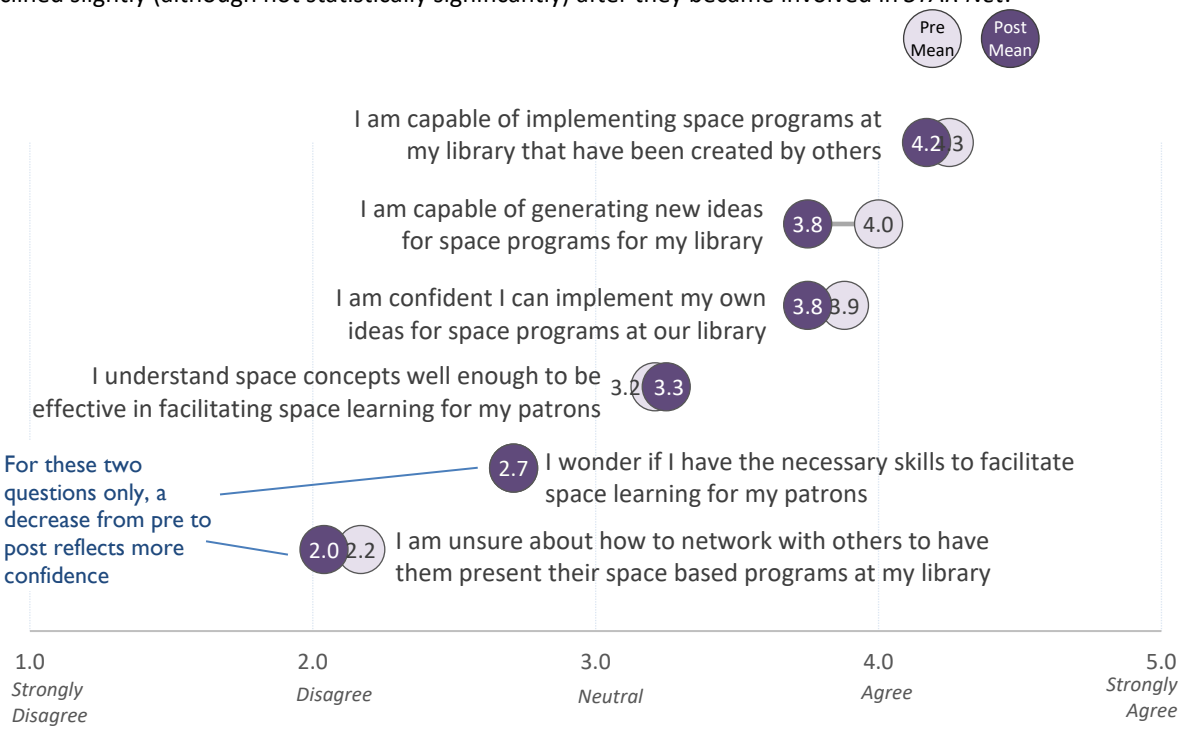
Source: Matched Library Staff Pre-Exhibit and Six Month Post-Exhibit Surveys; n = 20
Paired t-test comparing pre- and post-means significantly different: *p < .05

Figure 7. *Discover Earth* and *Explore Earth* librarians' confidence about implementing earth science programming was fairly high before they became involved in *STAR Net*, and remained essentially unchanged.



Source: Matched Library Staff Pre-Exhibit and Six Month Post-Exhibit Surveys; n = 23
None of the paired t-test comparing pre- and post-means were significantly different

Figure 8. *Discover Space* and *Explore Space* librarians' confidence about implementing earth science programming declined slightly (although not statistically significantly) after they became involved in *STAR Net*.



Source: Matched Library Staff Pre-Exhibit and Six Month Post-Exhibit Surveys; n = 24
None of the paired t-test comparing pre- and post-means were significantly different

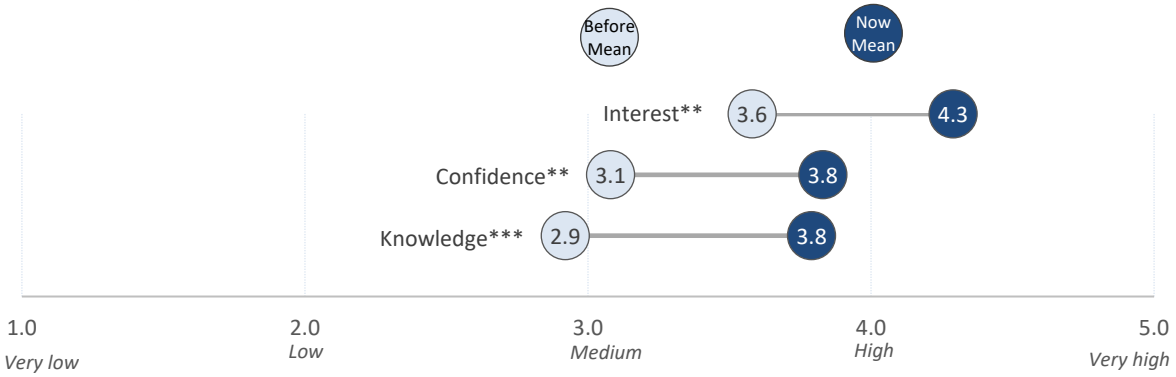
Library staff were also asked a series of questions on the post-survey that asked them to assess the impact that *STAR Net* had on their knowledge, interest, and confidence in STEM-based library programming. Library staff were asked to indicate what their knowledge, interest, and confidence was prior to becoming involved in *STAR Net* and what it was at the time they completed the survey, both on a scale from 1 = Very low to 5 = Very high. Library staff from all three exhibit topics reported significant increases, and reported especially large gains in both their interest in STEM-based programming and their confidence in facilitating STEM-based programming (see Figure 9 on the following page).

In contrast to the previously presented results from questions that were asked on both the pre- and the post-survey (which seemed to suggest that librarians hosting *Discover* or *Explore Space* may have lost confidence), when library staff hosting one of the *Space* exhibits were given the opportunity to indicate the impact that *STAR Net* had on their confidence, they reported it grew significantly. On average, *Discover* and *Explore Space* library staff reported that their confidence increased from low/medium before *STAR Net* to medium/high after *STAR Net*.

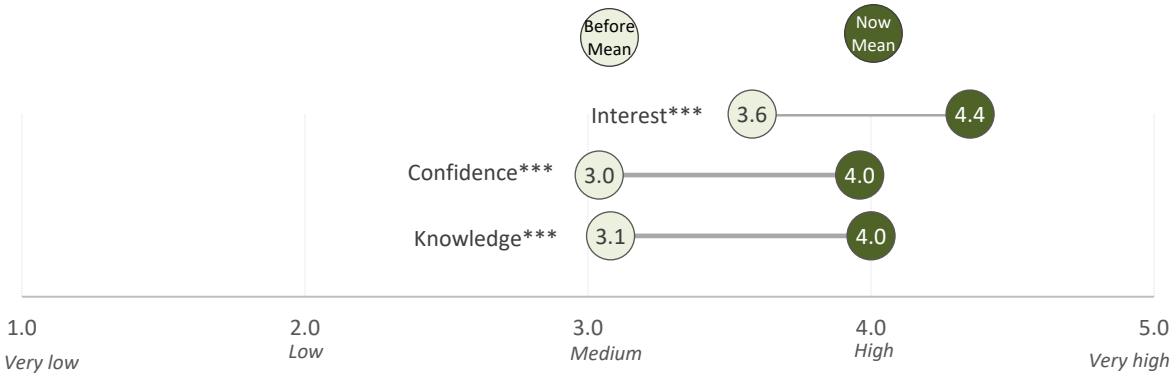
Figure 9. Library staff reported significant increases in their knowledge, interest, and confidence about how to implement STEM-based programming in their libraries as a result of their involvement in *STAR Net*.

Indicate your level of knowledge, interest, and confidence about STEM-based library programming BEFORE STAR Net and NOW (following the exhibit) in the following areas.

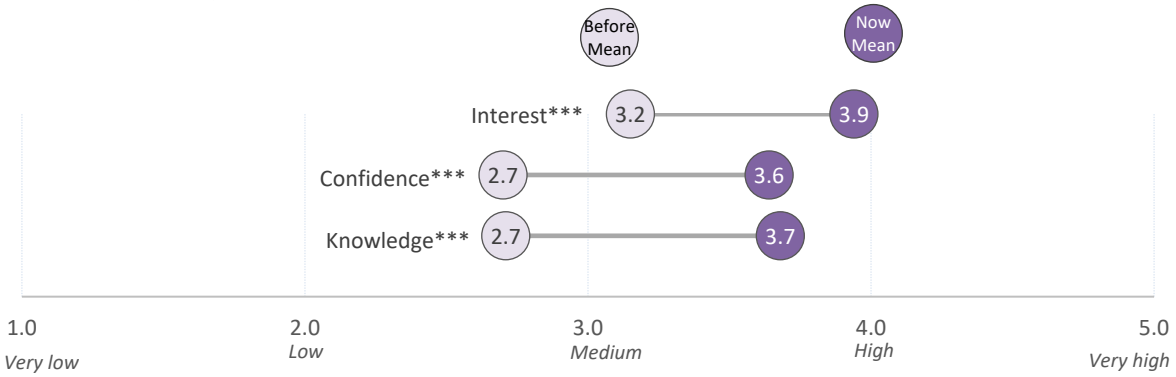
***Discover* and *Explore Tech* (n = 24)**



***Discover* and *Explore Earth* (n = 26)**



***Discover* and *Explore Space* (n = 34)**



Source: Six Month Post-Exhibit Surveys
Paired t-test comparing pre- and post-means significantly different: **p < .01; *** p <.001

In interviews and in response to open-ended survey and report questions, some librarians said the *STAR Net* training and resources increased their knowledge and confidence about how to deliver STEM-based library programming.

- "I am excited about developing STEM-based programming for our library. Before, I was apprehensive. I felt unqualified to do it."
- "I learned about some wonderful resources on *STAR Net*. I also gained a deeper understanding of developmentally appropriate science and technology programs."
- "Library staff have gained confidence and do not feel intimidated to facilitate STEM programming for all ages."
- "It has been a wonderful experience. I have loved having access to all of the wonderful resources and materials. The exhibit was wonderful and our patrons really enjoyed it. Being a part of *STAR Net* has introduced me to more STEM content and concepts and I feel more knowledgeable and confident to lead STEM programming at my library."
- "This experience has inspired our staff to feel confident in conducting STEM programs."

✓ **Indicator:** *STAR Net* Host Librarians increased their interest in developing and facilitating STEM-based library programming

Host librarians' interest in STEM-based programming was already relatively high prior to *STAR Net* (compared to their knowledge and confidence in how to facilitate STEM programming). However, they indicated they became even more interested and committed to developing and facilitating STEM-based programming.

As was shown in Figure 9 on the previous page, librarians hosting either the *Earth* or *Tech* exhibits on average reported their interest level was already medium/high prior to *STAR Net* (an average of 3.6 on a five-point scale). However, *Earth* and *Tech* librarians still reported significant gains in their interest in STEM-based programming, with the majority reporting their interest was high/very high after hosting a *STAR Net* exhibit (an average of 4.3 or 4.4). Librarians hosting a *Space* exhibit had lower interest than *Earth* or *Tech* librarians prior to *STAR Net*, with *Space* librarians reporting a medium interest level prior to becoming involved in the project (an average of 3.2). *Space* librarians' interest grew as well, with the majority reporting a high interest in STEM programming after hosting the *STAR Net* exhibit.

In response to interview and open-ended survey questions, many librarians said the exhibits inspired them to continue STEM programming they were already doing but with increased frequency, to launch programs that they had been considering but weren't sure if they were ready to do, or to encourage colleagues who had little exposure to STEM programming to become involved in STEM programming. For example:

- "[I have] more awareness of need for STEAM programming and the resources available."
- "It ignited a little bit of a push to research and see how much more we can do with it."
- "I enjoyed the experience immensely. I got a lot of great ideas for different programs. I had wanted to start a science club and the exhibit and programing related to the exhibit gave me the opening with the children I was looking for."
- "It continues to encourage me to continue with my STEM programming. After seeing the impact that this interactive exhibit had on our children and the interest shown by the adult patrons as well, it has encouraged me to stick with my STEM programming. It's interactive, fun and creates a safe

environment for the children to explore their own imaginations within the scope of a real-world profession."

- "It has opened my eyes to so many ideas and possibilities for future STEM programming."
- "Being a part of the *STAR Net* project made me think out of the box when it comes to programming, and gave me ideas for future programs as well."

Staff from a few libraries said they are now on the lookout for other opportunities and grants to do STEM-related programming. They had increased confidence in the own abilities to conduct STEM programming and host large exhibits, and were ready to pursue other opportunities. For example, one librarian said, "I have encouraged my library to continue STEM programming and we will be implementing more programs in 2018. I applied for the DiscoverE grant to fund programming."

Implementation

- ✓ **Indicator:** *STAR Net* Host Librarians develop and deliver their own activities and/or identify high quality non-LPI activities related to the exhibit while they have the exhibit
- ✓ **Indicator:** *STAR Net* Host Librarians adapt and deliver activities related to the exhibit developed by LPI

Although less than half (40%) the host library staff had received training focused on implementing STEM programming prior to becoming involved in *STAR Net* (as previously noted), the majority of library staff (79%) reported they had implemented STEM-based programming at their libraries prior to becoming involved in *STAR Net*. A sizable percentage (45% of all librarians completing the pre-survey) had already implemented six or more STEM programs. Staff from libraries hosting *Explore* exhibits had slightly more experience implementing STEM programs than staff from libraries hosting *Discover* exhibits: 47% of *Explore* librarians had previously implemented at least six STEM programs while 42% of *Discover* librarians had done so (see Table 3).

Table 3. The majority of library staff from host libraries reported that they had implemented STEM programming at their libraries prior to becoming involved in *STAR Net*.

We'd like to know about your experience with implementing science, technology or engineering programs prior to the Earth/Tech/Space *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.*	**All Respondents (n = 194)**		***Discover* (n = 55)**		***Explore* (n = 139)**	
	Count	**Percent**	**Count**	**Percent**	**Count**	**Percent**
0 programs	24	12%	8	15%	16	12%
1 program	14	7%	3	6%	11	8%
2 to 3 programs	37	19%	10	18%	27	19%
4 to 5 programs	27	14%	10	18%	17	12%
6 or more programs	88	45%	23	42%	65	47%
Not sure	4	2%	1	2%	3	2%

Source: Six Month Post-Exhibit Surveys

All of the libraries offered exhibit-related programs while they hosted the exhibit. Each *STAR Net* library was required to facilitate a minimum of 10 public programs in collaboration with community organizations, local scientists, and scientists and educators. The ten programs were expected to be for different age groups, including one opening event, three public programs for adults, three public programs for families, and three programs for out-of-school K-12 children. Libraries were also expected to use *STAR Net* resources as part of at least some of their programs.

All of the libraries that hosted an exhibit through July 2018 (when the evaluation team ceased collecting ALA Final Report data) met this expectation and most exceeded it. The libraries hosting the *Discover Space* exhibit offered the most programs, with a median of 20 programs (see Table 4 below). The average library hosting a smaller *Explore* exhibit (which had the exhibit for two months) hosted more programs per month than the average library hosting a larger *Discover* exhibit (which had the exhibit for three months).

Table 4. The majority of *STAR Net* libraries offered more than the required 10 programs while they hosted an exhibit.

Exhibit Topic	***Discover*** **Median number of programs each library offered during exhibit (over 3 months)**	***Explore*** **Median number of programs each library offered during exhibit (over 2 months)**
discover SPACE explore SPACE	20 (6.7 programs/month) (range 10 – 33)	14 (7.0 programs/month) (range 10 – 29)
discover TECH explore TECH	16 (5.3 programs/month) (range 12 – 22)	14 (7.0 programs/month) (range 10 – 19)
discover EARTH explore EARTH	12 (4.0 programs/month) (range 10 – 15)	15 (7.5 programs/month) (range 11 – 20)

Source: Six Month Post-Exhibit Surveys
n = 8 *Discover Space*, 8 *Discover Tech*, and 8 *Discover Earth*
n = 12 *Explore Space*, 12 *Explore Tech*, and 12 *Explore Earth*

The 60 libraries that hosted *STAR Net* exhibits through July 2018 facilitated a combined total of 860 programs, of which 540 were "required" programs (not including opening events).[6] Libraries hosted a variety of programming for children and adults. The ALA Report Form collected more detailed information about each of the required programs, including the format or focus of the program (see Table 5). (Libraries could indicate that a program used multiple formats.) The most popular program format was hands-on investigation, which was featured in half (50%) of all the required programs. Other frequently used formats included discussion (43% of programs), lecture (39%), and demonstration (39%).

Table 5. Half of all the *STAR Net* required programs included hands-on investigation.

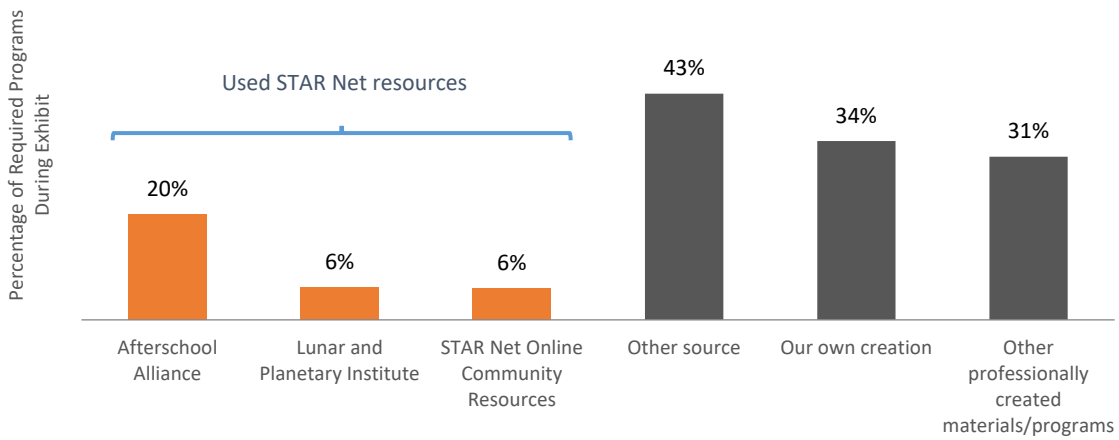
	All Respondents	
	Count	**Percent**
Hands-on investigation	271	50%
Discussion	233	43%
Lecture	208	39%
Demonstration	208	39%
Art-based STEM project	130	24%
Maker space activity	70	13%
STEM-related reading program	61	11%
Career-focused STEM learning program	48	9%
Documentary screening	31	6%
Field trip	25	5%
Other	33	6%

Source: ALA Final Report form for required programs; 540 required programs from 60 libraries

[6] Descriptions of program characteristics do not include opening event programs, for which EDC did not receive ALA Report data. Rather, they include the other nine programs each library was required to present while they hosted a *STAR Net* exhibit. Data regarding program characteristics were not collected regarding any supplemental programs that libraries implemented.

About a quarter of the required programs libraries implemented while hosting the exhibits used *STAR Net* sources. As shown in Figure 10, of programs that were delivered while libraries hosted the exhibits, 20% used materials from the Afterschool Alliance, 6% used curriculum developed by LPI, and 6% used resources from the *STAR Net* online community. (Some libraries used multiple sources for one program.)

Figure 10. When citing the content source for *STAR Net* required programs, most programs were created by library staff and/or professionally created.



Source: ALA Final Report Form; data from 540 required programs from 60 libraries (not including opening events)

✓ **Indicator:** *STAR Net* Host Librarians report and are observed to (during site visits) facilitate visitor interactions with the exhibit

Host librarians made use of the exhibits, either indirectly by offering programming related to exhibit topics, or directly by encouraging visitors to interact with the exhibits or check out library materials about earth science, technology, engineering, or space.

The evaluation team conducted site visits to 12 libraries while they were hosting a *STAR Net* exhibit. During each one- or two-day visit, evaluators noted when they observed library staff assist visitors with the exhibits. The team observed staff from eight of these 12 libraries help patrons interact with the exhibits.

For example, at one library hosting *Discover Space*, three different staff were observed interacting with visitors at different times, typically encouraging library patrons to visit a specific exhibit component or to read through some of the exhibit materials. One of the librarians said of the plasma globe, "It won't sting you—I promise!" When kids asked what it was, she said, "Read the side," and then she read it aloud to them. After a few minutes, she took them over to see other kiosks ("Have you seen this one? You can make your own solar system."). Another librarian at the same library approached and talked with two groups of school-age kids while they were standing in front of kiosks to encourage them to read through the materials. She also shared vocabulary about what the games were supposed to represent (e.g., gravitational pull).

At a library hosting *Discover Earth*, both library staff asked visitors numerous times if they had seen various parts of the exhibit. Library staff walked patrons over to see exhibit components, showed patrons how to use the kiosks, joined them in a Quiz Game, and asked them to complete a patron survey.

At a library hosting *Explore Space*, a librarian invited people as they came in to the library to stop and try out the telescope, and many visitors did stop for up to 10 minutes to check out the telescope and to hear what the facilitator had to say. Each time someone stopped by, the facilitator would give instructions on how to use the telescope and what each telescope was for.

- ✓ **Indicator:** *STAR Net* Host Librarians promote STEM materials in their library, such as by featuring/displaying STEM materials

The majority of libraries reported that they promoted exhibit-related books (and DVDs) to patrons through temporary displays near the exhibits. Almost all the *STAR Net* libraries the evaluation team visited displayed STEM-related materials near the exhibit, most frequently featuring STEM-related books available for check out. A few libraries described creating electronic or paper lists of books and other materials related to the exhibits and made these available to library patrons.

Results regarding patron circulation statistics are presented under evaluation question 4, regarding patron outcomes.

Sustainability

The vast majority of the libraries reported that they had offered additional STEM programming after the exhibit had left their libraries, and intended to continue doing so.

✓ **Indicator:** *STAR Net* Host Librarians continue to offer STEM programing in areas either related to the exhibit or in other STEM areas after the exhibit has left their library

The majority of directors (85%) who completed the Six Month Post-Exhibit Survey reported that their library had organized, hosted, or promoted additional STEM activities or programs after the exhibit had left their libraries (see Table 6 below). The average library had offered 20 programs during the six months since the exhibit had left their libraries, although the number of programs ranged greatly from only one program to as many as 368.

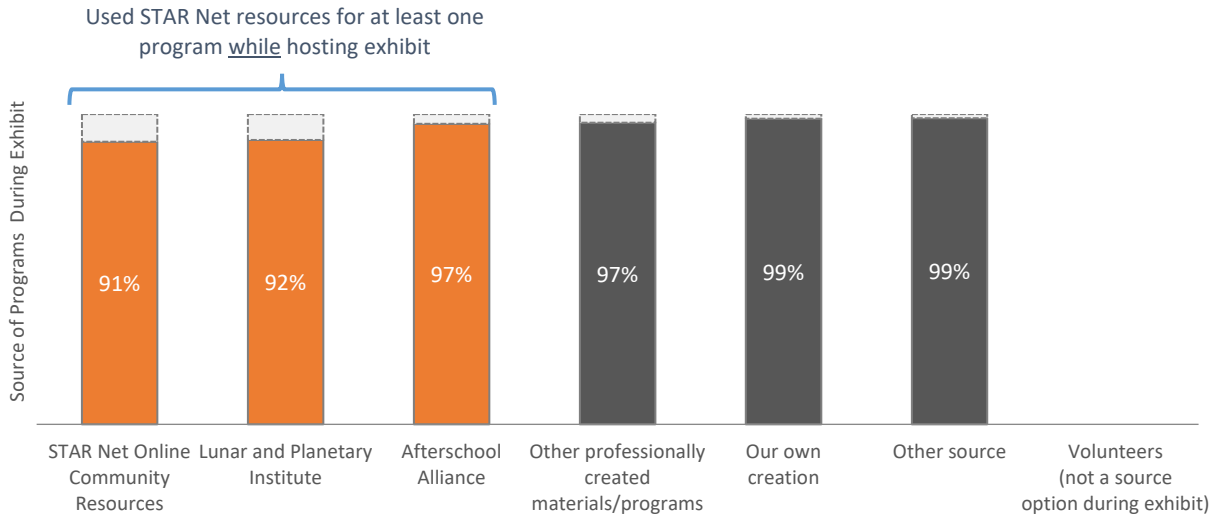
Table 6. The vast majority of *STAR Net* libraries continued to offer STEM programming after the exhibit had left their libraries.

In the six months since the exhibit left your library, has your library organized, hosted or promoted any additional STEM activities or programs?	**All Library Directors (n = 33)**		***Discover* (n = 14)**		***Explore* (n = 19)**	
	Count	**Percent**	**Count**	**Percent**	**Count**	**Percent**
Yes*	28	85%	12	86%	16	84%
No	4	12%	1	7%	3	16%
Not sure	1	3%	1	7%	0	-
**If yes…*						
Range in total number of programs directors reported library has done in six months since exhibit left library	1-368 programs		10-200 programs		1-368 programs	
Median number of programs done in six months since exhibit left library	20 programs		25 programs		11 programs	
Percentage of respondents indicating number of programs was based on an actual count (vs. an estimate)	18%		17%		19%	

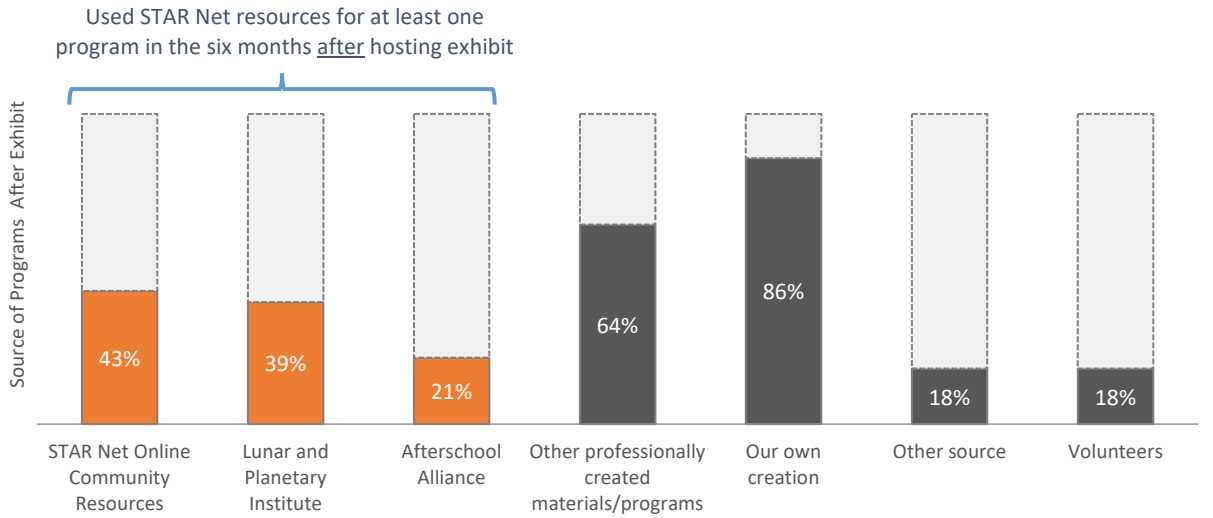
Source: ALA Final Report Form; data from 540 required programs from 60 libraries (not including opening events)

Figure 11 below compares the sources libraries used while hosting a *STAR Net* exhibit with those they used in the six months after the exhibit left their libraries. The vast majority of libraries used *STAR Net* resources for at least one program while hosting the exhibit (the top figure; respondents selected all the sources they used). Libraries that implemented STEM programming in the six months since the exhibit had left their libraries continued to use *STAR Net* resources, although to a lesser degree than while they hosted the exhibit (the bottom figure). A total of 43% of library directors said that the *STAR Net* CoP was a source for follow-up programs, 39% said they used LPI as a source of activities or programs, and 21% had used Afterschool Alliance resources in the six months since the exhibit had left their library.

Figure 11. When citing the content source for *STAR Net* required programs, almost all the host libraries reported using *STAR Net* resources while they hosted the exhibit (first chart, below). Libraries that reported hosting exhibit-related programming in the six months after the exhibit left their libraries continued to use *STAR Net* resources for programming, although to a lesser degree than while they were hosting the exhibit.



Source: ALA Final Report Form
Data from 540 required programs from 60 libraries (not including opening events)



Source: Six Month Post-Exhibit Survey
n = 27 *STAR Net* Project Directors who reported their library had implemented STEM programming in six months since exhibit had left their library

The vast majority (91%) of directors who completed the Six Month Post-Exhibit Survey said they had plans to organize or host science, technology, or engineering activities or programs at their libraries in the future.

✓ **Indicator:** *STAR Net* Host Librarians describe the library as one place to learn STEM and that *STAR Net* helped them perceive their library as a STEM learning place

Almost all the *STAR Net* host librarians said libraries can and should promote STEM learning in their communities. Librarians described how STEM fit into their mission as an important community institution. When asked if they saw a role for their library in encouraging science, technology, and/or engineering learning, almost all the librarians involved in the project said "Yes" (98%).

When asked to explain their answers, the library staff most frequently explained that it was part of their libraries' mission to promote lifelong learning, and/or that they thought everyone should learn STEM—especially children. A small number of library staff said public libraries are uniquely positioned to promote STEM because they are broadly accessible, can (and should) reach individuals who are underrepresented in STEM, and can make STEM fun. A handful of library staff mentioned that libraries should offer STEM programming because patrons requested it, or because there were few other STEM options in their community.

Example of librarians' responses include:

- "We are the perfect venue to partner with organizations in order to increase STEM learning in our community. As a trusted education provider that serves diverse audiences, we have the resources and interest to be able to increase STEM learning in our community and are always looking for resources that can enhance our capacity to do so."
- *"Discover Tech* kicked off a year of STEM for our library and 10 months later, we're still going strong. We had so many STEM programs over the summer; patrons loved that. We support the schools in their efforts and are closing gaps in our collections in that effort."
- "Libraries are places to connect with information. Hands-on learning is a terrific way to gain new information. STEAM learning encourages exploration, which is where new ideas develop."
- "Our library system has begun 'zucchini bread' STEAM programming. If you advertise a program as specific to STEM, for example, come to our 'Coding' program, or 'Robotics,' or even 'Citizen Science,' we find that the attendees are those who have already self-identified as interested in coding, robotics, or science. We are very much sold on the value of STEAM programming and learning. We would like to reach not just those self-identified as interested, but those who don't see STEAM as interesting to them. To that end, we look at how we can incorporate STEAM concepts in any program. In particular, we've found fandom is a wonderful foil for STEAM programming. We host a Harry Potter themed summer camp, teaching classes on Potions, Care of Magical Creatures, and Herbology, but each one is based in STEAM principles and teach real skills."
- "We are educators as well, and STEM learning should be a part of our programming—we have made it our job to stay on top of information and trends alike."
- "We see ourselves as a comprehensive learning center, so STEM is an important aspect of that."
- "STEM learning is one sure way to encourage the math and science fields among our youth. Libraries can utilize this type of learning opportunity as an extension to formal school learning

experiences. If public libraries and schools developed a close collaboration to address these opportunities, our youth could have a better understanding of STEM concepts."

- "We live in an industrial community where STEM is a vital part of the local economy. Yet the community's isolation from centers of higher education, museums, etc. greatly reduces access by local citizens and their children to STEM-related educational opportunities. Libraries can help to fill this gap by hosting STEM-related exhibits and other activities, and by providing publicly-accessible maker space resources. We have been attempting to do these things. Although we feel that our *Explore* exhibit project was not the success we had hoped for, we do intend to continue planning and hosting STEM-related activities for all ages as we have opportunity."
- "I think rural libraries can and should become STE(A)M after school learning centers. We are planning workshops using LittleBits, classes in coding in Scratch, as well as monthly hands-on science events."
- "Libraries are and always will be learning spaces. We can bridge the gap between what schools are doing to encourage STEM and what parents can do at home to encourage the same."
- "STEM training is critical to young girls' education and career goals, directly affecting their income ability in the near future. The library can be a safe haven for girls to explore these avenues, freely in play."
- "Libraries have to be involved in STEM. STEM fosters creativity, learning, curiosity which are all foundations the library believes in. Also, libraries have to offer STEM to all to level the playing field. Too many students/adults do not have access to this kind of hands-on experimenting."

Two respondents were "Unsure" if they saw a role for their library in encouraging science, technology, and/or engineering learning, and none said "No." One respondent who answered "Unsure" said, "I feel that is the library director's responsibility." The other respondent did not provide an explanation for why they were unsure.

✓ **Indicator:** *STAR Net* Host Librarians identify and secure STEM library resources after the exhibition left (e.g., books, videos)

Of the project directors who completed the post-exhibit survey, 70% (n = 23) reported that their library had acquired additional science, technology, or engineering resources in the six months since the exhibit had left their library. (Seven directors said their library had not acquired STEM materials, and three directors were "Not sure.") Almost all the directors reported that their library had acquired books (see Table 7, on the left). Three quarters of the libraries had acquired science equipment such as microscopes, robotics kits, or circuit kits. Some libraries also acquired DVDs, movies, eBooks and/or audiobooks.

When asked about their reasons for acquiring additional science, technology, or engineering resources, directors most commonly reported that it was due to requests from library patrons or from library staff (see Table 8, on the right). Just under half the directors reported they had noticed a gap in their collection either due to the exhibit or associated programming.

Table 7. Libraries reported acquiring a variety of STEM resources in the six months since the exhibit left the library.

Resources	Count	Percent
Books	21	91%
Equipment (e.g., microscopes, robotics/circuit kits)	17	74%
DVDs	11	48%
Movies	8	35%
eBooks	5	22%
Audiobooks	4	17%
Articles	2	9%
Web resources	2	9%
Music	2	9%
Photographs	1	4%
Prints	0	0%
Databases	0	0%
Maps	0	0%
Recordings	0	0%
Other; selected responses: • *Keva planks* • *magnetic board* • *became a NASA@ My Library site*	5	22%

Source: Library Staff Six Month Post-Exhibit Surveys; n = 23 libraries

Table 8. Libraries acquired STEM resources for a variety of reasons in the six months since the exhibit left the library.

Reasons	Count	Percent
Requests from library patrons	12	52%
Requests from librarians or other library staff	12	52%
Noticed a gap in the collection due to the exhibit	11	48%
Noticed a gap in the collection due to the related programming	10	43%
Requests from K-12 schools	5	22%
Requests from informal educators or programs (for example, after-school program leaders or museums)	3	13%
Requests from STEM professionals	3	13%

Source: Library Staff Six Month Post-Exhibit Surveys; n = 23 libraries

Question 2: To what extent (and how) do Phase 2 project team members, public library staff, and STEM professionals and educators develop partnerships to provide STEM programming for youth and adults?

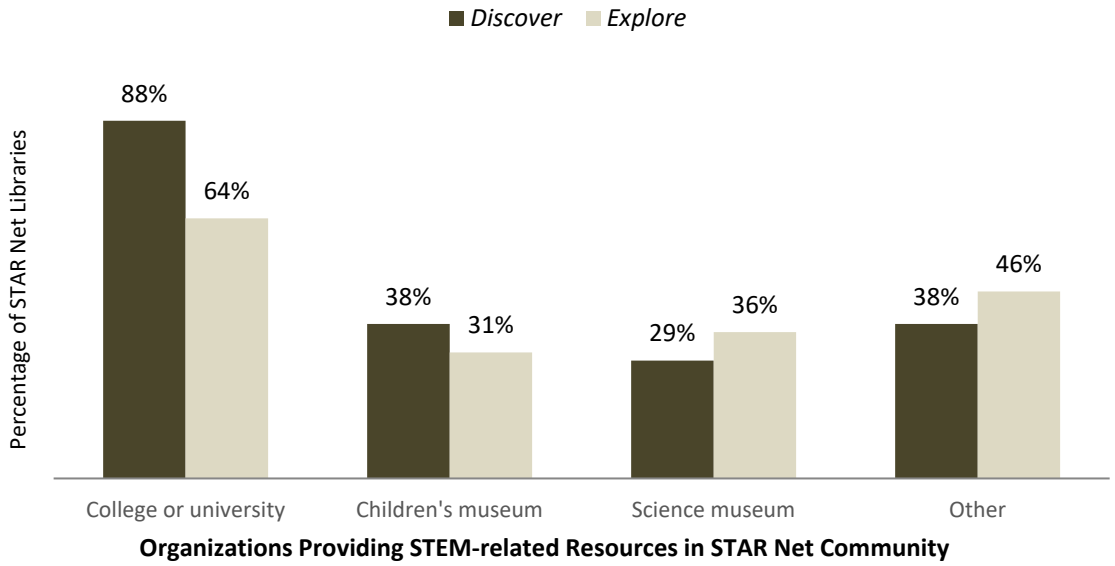
Before describing the programming partnerships that *STAR Net* library staff developed as a result of their involvement in the project, it is important to understand libraries' prior experiences conducting programming before they became involved in *STAR Net*, as well as the STEM resources available in their communities.

On the pre-survey, almost all the *STAR Net* directors reported that their libraries had offered STEM-related programming during the 12 months prior to receiving the exhibit. (All but two of the 63 project directors who answered the pre-survey questions said their library had previously offered STEM programming.) Although almost all the libraries had experience with STEM programming prior to becoming involved in *STAR Net*, the extent of their experience varied. Libraries had offered as few as zero programs to as many as 698 programs for patrons during the year before they received the exhibit.

Almost all the project directors said their library staff were responsible both for developing and implementing STEM programming at their library. In addition, a substantial number of libraries already relied on outside partners to develop programming (67%) and implement programming (78%).

The pre-survey asked project directors what STEM resources were available in their communities. The majority of libraries reported that they had a college and/or university in their community (with *Discover* host communities being more likely to have a higher education institution). However, only a third of the communities had a children's museum and/or a science museum.

Figure 12. While most of the libraries hosting *STAR Net* exhibits had a college or university in their community, only a third had a children's museum or science museum.



Source: Library Staff Pre-Exhibit Survey; 24 *Discover* libraries and 39 *Explore* libraries

Finally, the majority of library directors (82%) reported on the pre-survey that they had partnered with other organizations in their communities to offer STEM programming before becoming involved in *STAR Net*. Although only about a third of project directors indicated that they had a science center or museum in their community, the majority of project directors (57%) said they had collaborated with science centers or museums to provide programming (see Table 9). Some libraries had partnered with other institutions, including higher education institutions, zoos/aquariums, or research institutes.

Table 9. Most of the libraries hosting *STAR Net* exhibits previously partnered with a STEM organization prior to becoming involved in the project.

Has your library partnered/collaborated with STEM organizations for program development and implementation? Please check all that apply.	**All Library Directors (n = 63)**		***Discover* (n = 24)**		***Explore* (n = 39)**	
	Count	**Percent**	**Count**	**Percent**	**Count**	**Percent**
We have not partnered or collaborated with a STEM organization	11	18%	2	8%	9	23%
Science centers/museums	36	57%	14	58%	22	56%
Universities/colleges	35	56%	14	58%	21	54%
Zoos/aquariums	20	32%	8	33%	12	31%
Community colleges	20	32%	7	29%	13	33%
Research institutes – federal	4	6%	2	8%	2	5%
Research institutes – non-federal	2	3%	0	-	2	5%
Other; selected responses: • *Idaho Commission for Libraries* • *Lincoln County Extension office 4H* • *Local robotics team* • *Non-profit DIY agencies; local schools* • *Non-profit organizations* • *We have partnered with the local hospital, with the Monsanto Fund, and with Georgia Pacific, the main local employer. In the past we've partnered with the local zoo, but it has now closed.*	19	30%	8	33%	11	28%

Source: Library Staff Pre-Exhibit Survey

✓ **Indicator:** *STAR Net* Host Librarians contact and coordinate with science and engineering professionals and afterschool professionals to deliver programs related to exhibit topics

The majority of the programs that libraries presented while they hosted *STAR Net* exhibits were facilitated by external partners.

On the ALA Final Report form, libraries indicated who presented each of their required *STAR Net* programs. Presenters' affiliations were classified into the categories shown in Table 10. Library staff facilitated 42% of the required programs by themselves. The remaining programs were facilitated by external partners, or by library staff together with one or more external partners. The most frequently utilized external partners included higher education institutions (who led 11% of required programs), individuals who were not affiliated with a particular STEM organization (10% of programs), and staff from science centers or museums (9% of programs).

Table 10. While libraries hosted a *STAR Net* exhibit, the majority of the programs they implemented were facilitated by external partners.

	All Required Programs (n = 512)		*Discover* (n = 215)		*Explore* (n = 297)	
	Count	Percent	Count	Percent	Count	Percent
Library staff	214	42%	86	40%	128	43%
University/college	56	11%	22	10%	34	11%
Individual STEM professional(s)	50	10%	24	11%	26	9%
Science center/museum	45	9%	25	12%	20	7%
Business	36	7%	12	6%	24	8%
Government agency (e.g., state park, NASA)	31	6%	13	6%	18	6%
STEM professional group (e.g., SWE, SSA)	28	5%	13	6%	15	5%
Other	16	3%	3	1%	13	4%
Library staff together with external partner(s)	15	3%	7	3%	8	3%
K-12 schools/teachers	13	3%	8	4%	5	2%
Afterschool organizations	8	2%	2	1%	6	2%

Source: ALA Final Report form for required programs; 512 programs from 57 libraries
(3 libraries did not provide information about who presented their required programs)
Data from open-ended question regarding who presenter(s) were was coded into categories

The majority of libraries that hosted one of the exhibits reached out to the STEM community for help with programming, and successfully developed connections with science or engineering professionals. Several libraries said *STAR Net* facilitated the formation of new partnerships within their community. Library staff reported developing new partnerships with local colleges and universities, local businesses, government agencies, science coordinators from local K-12 schools, museums, professional organizations, and individual STEM professionals. There were many examples of successful programming that involved STEM professionals from the local communities. Table 11 highlights several examples from the ALA Final Report forms.

Table 11. Libraries developed partnerships with various STEM organizations while they hosted one of the *STAR Net* exhibits.

Partner Type	Examples of Successful Partnerships Libraries Developed While Hosting Exhibit
Higher education institutions 	• [Our library] has previously partnered with [our state] State University, but the partnership has expanded to include the Computer Science Department and the Department of Biological Sciences. Moving forward, the departments have agreed to work with the library to create one-time STEM programs every quarter. • We're quite thrilled that the new partnership with [our state's] NASA Space Grant Consortium, established specifically for *Discover Space*, has turned into an excellent relationship. We have more programs planned with them in the future. Their program coordinator drove [an hour] specifically to record a very short instructional video on how to use the Dobsonian telescope we purchased. This video has proven to be of great value to [our library's] staff! • The library also partnered with [university's] College of Natural and Applied Sciences to host a number of programs that were well-attended. In turn, the library helped the university promote and plan its solar eclipse viewing event.
Museums and science centers 	• One partner we were very glad to strengthen ties to was [a science center], which houses natural history galleries, an observatory, and a planetarium. Our connection in the past was friendly—we each posted information about the other's events, but we had always wanted to do something more substantial. This project gave us the opportunity to do so…We have since had the center's teen group back to the library for a local history project, and see ourselves committing to more mutual events. • We had worked with [a planetarium] in the past, but not very consistently. The solar eclipse this summer and *Discover Earth* opened up dialogue and reconnected us as agencies. Talks continue between us for future partnership opportunities. The planetarium is interested in providing after school programs in the library on an ongoing basis. It helps them reach a larger audience and showcase what programs are offered at the planetarium, and it assists us in supplementing our afterschool programs with high quality, presenter-based, STEM programming. • We partnered with [a science center]. We are now circulating a family pass for patrons to visit the center for free. We hadn't purchased one before.
Conservation groups, STEM professional groups 	• The partnerships with the [our state's] Extension and the Wildlife Federation proved to be so helpful. These agencies provided wonderful presenters for our planned programs. From these partnerships the library experienced a real live weather station collecting actual weather data. It was a definite eye attraction sitting on the front lawn of the library. The library also received an EnviroScape on permanent loan for future water conservation programs. The library also received water quality testing kits for future water conservation programs. These agencies are excellent resources for future library programs, especially for the upcoming Summer Reading programs with the theme of "Build a Better World." Therefore, the library will plan to use these partners for future programming.

Partner Type	Examples of Successful Partnerships Libraries Developed While Hosting Exhibit
Solar System Ambassadors or local astronomers 	• The exhibit allowed us to forge a new partnership with a local amateur astronomy club and we plan to continue that partnership to continue offering astronomy related programing as part of our STEM offerings. • We formed a relationship with [a local astronomy group] and they have agreed to conduct STEM programming at our library on a bi-monthly basis—not only in regards to astronomy but other STEM-related fields. • We created some wonderful partnerships as a result of *Discover Space*. We now know many folks at area schools that we did not before, and have formed a terrific bond with the [state's] Astronomical Society. We have planned summer reading programming that includes area towns, and a program that includes a solar observation event sponsored by the [state's] Astronomical Society. • The library will definitely invite our NASA Solar System Ambassador back on a regular basis. Her presentation skills, knowledge and love of space science were inspirational to many adults and young adults who attended her programs. When program participants who attended her first program learned she would make two more presentations, they immediately wanted to know the dates and times…We have worked with our local Astronomical Society for several years to host successful star-viewing events and will continue this partnership.
Government agencies 	• [Our library] created a great relationship with [our state's] Department of Conservation who did three programs for the exhibition. The library plans to continue the relationship. They offered us free fishing poles for check-out to library users. The library will try to schedule them for more programs in the future. • Several years ago [our library] had a partnership with [our state's department of natural resources], but over time, the partnership lapsed. The exhibit revitalized the partnership. [Our library] will work to support future programs offered by them. The Library will also partner with the organization to create StoryWalks. • The Police Department partnered with the library for STEM Makerfest and did a presentation on forensic science. The partnership will continue and the police department will offer a drone program for children and teens in spring of 2018. • Sometimes we forget about the things and people in our own backyard. Our city engineer was a great speaker and there's no reason why we couldn't get him to return and to also invite someone from wastewater or building inspection, etc. to talk about the science of their jobs. Our regional electric cooperative shared their engineer's time to talk about home solar and wind, and they could also be asked to talk about electricity and safety, other ways to save energy, etc.
Schools 	• We partnered with the local school district and made connections with their science coordinators. The teachers were very interested in the juvenile science books we have and our non-fiction DVD collection. They have asked us to continue to keep them notified of any science programs we have at the library and we intend to continue to invite the students and teachers to attend.

Partner Type	Examples of Successful Partnerships Libraries Developed While Hosting Exhibit
Local businesses 	• This project was our first significant partnership with [a nearby business]. Their staff include scientists and economists from around the world, and they are based about 15 minutes from the library, so this new partnership will open up a lot of fantastic programming opportunities for us. We would like to both host more speakers from [this organization], and we would like to work together to do some school visits.
Afterschool programs 	• One of our more successful partnerships came with the local Girl Scout troop. A group of Girl Scouts participated in one of the programs that was developed specifically for girls in science. They really enjoyed it and have shown an interest in continuing to participate in future library activities and programs. • Many partnerships were created with this project. A new partnership was created with a local Boy Scout group. They were able to visit our library and museum, the exhibit, and attend a program to fulfill requirements for different badges. We created a new partnership with an afterschool program in our neighborhood. We will continue working with them and inviting them to our programs and encouraging them to encourage families to come in for additional STEM opportunities.
Individual STEM professionals 	• [Our library] was able to expand on its partnerships through this exhibit. For the opening event 'Carnival of Inventions' several scientists presented who had never been to our library before, including one who brought a Tesla Coil.

Source: ALA Final Report from 60 libraries

Some libraries said they had not developed new partnerships, but had strengthened existing partnerships. For example, one library described how the project had given them the opportunity to strengthen their relationships with both a planetarium and a science center, and that they were planning to provide programming for the 2017 solar eclipse. Another library said:

> "We did not create any new partnerships through this project, but we did continue working with previous partners and will continue to do so in the future. Our local tourism commissions have been helpful with publicity, and we have worked with the city to provide additional programs that we don't do regularly."

In interviews and on the ALA Final Report, a few library staff said they had difficulties in getting a response from local schools. For example, one librarian said, "We would have liked to have strengthened the partnership with our local school district, it just didn't happen with this project. We had better interest and attendance from a school district 45 miles away." Another librarian said:

> "While the school district transportation department was very supportive, the Superintendent's Office and individual teachers were not. For example, I never received a call-back from any of the MESA teachers, the GATE program coordinator, or the high school astronomy club leader. Of course, we will continue to reach out to schools, teachers and students, [but] I don't think I'll bother

to contact the District Offices again. I do know from experience that teachers have their curriculum to teach, not enough time to do it, and are over-worked and underpaid."

Host libraries continued to collaborate with external partners to implement STEM-based programming after the *STAR Net* exhibits left their libraries, although to a lesser degree than when they hosted the exhibits. As previously described, 85% of the libraries completing a post-survey reported implementing STEM in the six months after the exhibit left their libraries. Of libraries that continued to implement STEM programs, 64% of libraries had STEM programs that were facilitated by external partners (see Table 12 below).

Table 12. Of the 85% of *STAR Net* libraries that implemented STEM-based programs in the six months after the exhibit left their libraries, 64% of them offered STEM programs that were facilitated by external partners.

[If answered "yes," library has conducted STEM programs in six months since exhibit left their library] Who conducted the STEM programs at your library?	**All Library Directors (n = 28)**		***Discover* (n = 12)**		***Explore* (n = 16)**	
	Count	**Percent**	**Count**	**Percent**	**Count**	**Percent**
Library staff	27	98%	12	100%	15	94%
Outside partners	18	64%	8	67%	10	63%
Volunteers	7	25%	4	33%	3	19%
Other; selected responses: • *Work Study students*	1	4%	1	8%	0	-

Source: Library Staff Six Month Post-Exhibit Surveys

Libraries partnered with a variety of organizations to implement STEM programming in the six months after the exhibit left their library (see Table 13). Science centers and museums were the most popular partners, with 43% of libraries that implemented STEM programs reporting that they had partnered with a science center or museum to develop or implement programming. A third of the libraries (32%) reported that they had partnered with universities or colleges to conduct STEM programming. A third of the libraries (32%) implemented STEM programming in the six months since the exhibit left their library but did not partner with any STEM organizations either to develop or implement it.

Table 13. Libraries partnered with a variety of organizations to implement STEM programming in the six months after the exhibit left their library.

[If answered "yes," library has conducted STEM programs in six months since exhibit left their library] Did your library partner/collaborate with STEM organizations for program development and implementation?	**All Library Directors (n = 28)**		***Discover*** **(n = 12)**		***Explore*** **(n = 16)**	
	Count	**Percent**	**Count**	**Percent**	**Count**	**Percent**
We did not partner or collaborate with a STEM organization	9	32%	5	42%	4	25%
Science centers/museums	12	43%	5	42%	7	44%
Universities/colleges	9	32%	6	50%	3	19%
Zoos/aquariums	4	14%	0	-	4	25%
Community colleges	3	11%	1	8%	2	13%
Research institutes – non-federal	1	4%	1	8%	0	-
Research institutes – federal	1	4%	0	-	1	6%
Other; selected responses: • *state park* • *public school system* • *statewide resource center* • *conservation organization*	4	14%	1	8%	3	19%

Source: Library Staff Six Month Post-Exhibit Surveys

Many libraries said that they expected the partnerships they had established to continue in the future. Selected comments from libraries are listed below:

- "We have and will continue to have a lasting relationship with these partners. We have collaborated on many projects. It seems as we work together, a greater end result or impact is made possible."
- "[Our library] is already planning to work with both of these excellent partners in 2019 when the Summer Reading Celebration has a space theme."
- "We partnered with [two universities]. We have future events planned with them now as a result of making these contacts."
- "When we were writing the grant, we began partnering with [two local nonprofits]. We have continued to do ecology programs with them at the library ever since. We plan to do more this April and during summer."

- "The *Discover Space* exhibit has opened the doors for us to our local community of STEM-learning organizations and we intend to work with these organizations to further and foster a love of science, technology, engineering and math in all of our community!"
- "We do indeed plan to work with all of our community partners in the future. Possibilities for future work with area schools are exciting. We hope, for example, to encourage school groups to make use of our maker space resources. We had already begun discussing such efforts before the exhibit came, and will continue them in the coming school year…Eventually we hope to revisit the idea of hosting STEM-related events for adults. The possibilities for such remain great, if we can just get more time to plan, prepare, and publicize."
- "Our most successful collaboration was with [our city's] STEM Coalition. The library joined the coalition because of this exhibit and helped host a STEM Family Night that brought over 40 different people and organizations together to have a STEM based activity for K-5 youth. We are already planning another Family Night, modeled on the success of the first one, but with more time to do the hands-on activities. We also greatly strengthened our relationship with the [local] school district. Many teachers requested field trips to the library next year, which is something we are trying to accommodate."
- "Our primary contact within [our city]…organizes all of the [nearby] observatory activities. He is a gem to work with and we are brainstorming how the library and the city can create a makerspace in a city building."
- "People were so generous and enthusiastic about *Explore Tech* and our focus on engaging girls. We plan to continue all of the partnerships. We already have plans with several partners. We will also invite the organizations to take part in our How-To Festival coming in the autumn of 2018. We're exploring other ways of teaming up with them to encourage scientific curiosity in our community. It was so valuable to have the support of so many people in our local STEM community during the exhibit. Connecting with people at community organizations was the biggest benefit of the exhibit for us."

A few librarians said that developing partnerships and strengthening community ties were the primary outcomes of their involvement in *STAR Net*. Being a *STAR Net* host library provided them with greater visibility in the community. One librarian said, "I liked the supportive environment that *STAR Net* provided us. I value the stronger community partnerships that have occurred because of the project." Another said:

> "I had no idea what kind of support I could get from our community, especially where to get the program presenters. As soon as we got the word out, we received tremendous help, such as from engineers with NASA and LPI. Even though we are not able to implement high quality science/engineering programs ourselves, we can rely on people in our community, who would like to make a difference and inspire others to get interested in science- and engineering-related topics and activities."

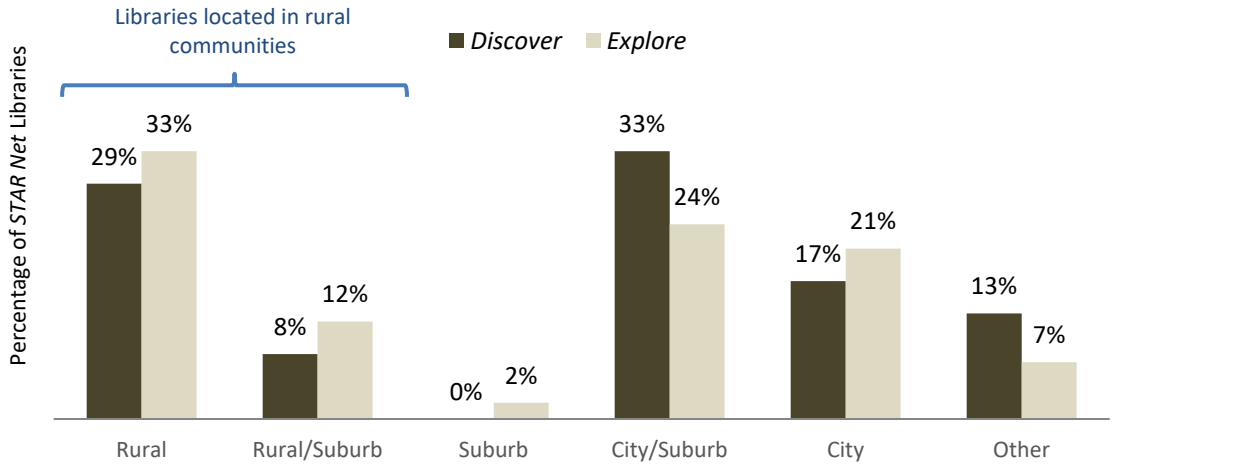
Question 3: To what extent (and how) are the *STAR Net* Phase 2 exhibits and programming effective in reaching underserved library populations?

The libraries that hosted the exhibits reported that they had success in reaching their communities, often attracting new visitors to their libraries.

Before describing how successful the *STAR Net* libraries were in reaching populations that are underserved or underrepresented in STEM, it is important to understand whether the selected libraries are located in communities that have few STEM resources and/or that have audiences who are underrepresented in STEM.

The *STAR Net* libraries and their communities vary in size, proximity to major urban areas, and demographics. A combined total of 42% of the libraries were located in rural communities: 37% of the *Discover* libraries and 45% of the *Explore* libraries self-identified as being located in either rural or rural/suburban communities (see Figure 13 below).

Figure 13. A combined total of 42% of *Discover* and *Explore* libraries are located in rural or rural/suburban locations.



Source: ALA Final Report form; 24 *Discover* libraries and 42 *Explore* libraries

As reported in the previous section regarding partnership development, the majority of libraries (73%) reported that they had a college and/or university in their community, but only a third of the communities had a children's museum and/or a science museum.

Although most of the host library communities had access to at least some STEM resources, several library staff and patrons remarked that they would not normally have had access to the high-quality exhibit materials and programming that *STAR Net* provided. One library patron said, "This is a good idea for libraries. We don't ever see anything like this here." Another patron said, "Our children need things like this in their lives. They would not see anything like this if it were not here and free." A librarian said,

"It's so important to bring these exhibits to rural areas. I know there are a lot of issues with urban areas as well, but I think it is different when you have some of the same barriers living in a rural area—plus the distance, travel time, etc. It's just such an incredible opportunity to have something like this in your hometown for us. For us, it's a long drive to get to a science museum. So I just want to emphasize the importance of bringing these [exhibits] to rural communities."

✓ **Indicator:** *STAR Net* Host Librarians reach the audience(s) they proposed to reach in their application

The *STAR Net* application asked libraries to identify at least one audience historically underrepresented in STEM fields and describe how they would reach this audience with the exhibition and associated programming. Two questions on the ALA Final Report then asked libraries to describe whether or not they were successful in reaching these audiences overall, as well as specifically with their exhibit-related programs. Libraries' responses were then coded. Table 14 shows the percent of libraries that planned to reach each specific group, as well as the percent of libraries that reached their target population. Most libraries intended to reach more than one audience.

The table comes with caveats. The audience-level percentages (e.g., lower-income populations) likely underestimate actual outreach success. In some cases, libraries' responses on the ALA Final Report were not sufficiently specific to determine whether the library had successfully served the population they had planned to reach. In other cases, libraries reported that they reached a different population than the one described in their application, and it was unclear if the library had changed their outreach strategy (from one audience to another) or simply broadened it to include additional audiences. Finally, the questions were asked in an "open-ended" fashion and then categorized after the fact, likely leading to undercounting.

Regardless, the vast majority of libraries (93%) reported that they did reach at least one audience who is underrepresented in STEM.

Table 14. The majority of libraries were successful in reaching at least one audience historically underrepresented in STEM fields. As explained in the text of the report, the percentages in the table likely underestimate libraries' actual success in reaching specific underrepresented populations.

Target Audience	Percent of all host libraries that planned to reach this audience (from *STAR Net* application)	Percent of libraries that planned to reach this audience that reported doing so (from ALA Final Report)
Reached at least one audience underserved or underrepresented in STEM	100%	93%
Lower-income populations	66%	49%
American Indian or Alaska Native; Black, African or African Americans; Hispanic/Latino/Latina	45%	59%
Girls/women	26%	59%
Recent immigrants	11%	14%
Rural	11%	57%
Individuals with special needs	3%	50%

Source: Applications to host *STAR Net* exhibit and ALA Final Report form; 60 libraries

Table 15 highlights several examples from the ALA Final Report forms in which libraries describe how they successfully recruited specific audiences to see the exhibit or attending programming.

Table 15. Libraries described many examples of successfully reaching various underrepresented audiences while they hosted one of the *STAR Net* exhibits.

Audience	**Examples** *(while each example is shown within one audience category, some examples reference multiple audiences)*
Lower-income populations	• We specifically wanted to target lower-income populations. By offering to share the cost of busing with the public school districts, we successfully brought in more than 20 classes for field trips to the exhibits. Many of these students begged their parents to return to the exhibit and they did, bringing new patrons into the library. We also partnered with [an] afterschool group successfully; they brought 10 groups of students from all over the county area to tour the exhibit and do one of the STEM activities. These field trips encompassed K-12 classes. As 79% of students in our two districts qualify for free or reduced lunches, we are confident we achieved our goal of reaching lower-income populations. • Our community leaders have identified an area of the city where poverty is the highest. Transportation barriers exist for families in this zone, which limit their access to our libraries and other opportunities to expand educational and recreational learning. We provide Mobile Library services to residents with limited transportation; however, this provides only limited components from the full range of services and programs offered by the Library. The Library used *Explore Space* grant funds to provide transportation for third graders in two schools and all children at a third community center to visit the exhibit at the Library Center. Library staff worked with the summer school coordinator to manage the school visits. These were three-hour visits during which half the students received a guided tour of the *Explore Space* exhibit while the other half engaged in activities such as astronaut training. At the midpoint, the groups switched. The teachers extended the field trip experience by having each student pretend to be a reporter and create a news article after returning to the classroom. • One underrepresented audience we know we connected with were those of poor economic status. This is a poor community and many people were grateful to have a museum level exhibit available to them locally—something many families would not be able to experience otherwise. We absolutely were able to reach an underrepresented audience and gave access to STEM topics that families of the area would not have otherwise been exposed to. • Our goal was to reach socioeconomically disadvantaged students in [the area]. I think we accomplished that admirably, because we reached over 85% of all K-5th graders in [the area]. We hosted 86 of the 92 K-5 classrooms within the School District (93%), plus an additional 8 private classrooms or homeschool groups. We reached 2,067 kids through their classrooms. With additional funding by outside groups, we were able to pay for all the field trip school buses, meaning that parents were not asked to help pay for their children to attend. By having a free school trip, we reduced as many barriers as we could to bring poor children to the library to visit the STEM exhibit.
American Indian or Alaska Native;	• We are a predominantly Hispanic community so a great percentage of exhibit visitors were of that minority group. Also, young Hispanic girls were an audience we'd hope

Audience	Examples *(while each example is shown within one audience category, some examples reference multiple audiences)*
Black, African or African Americans; Hispanic/Latino/ Latina	to reach and most of our programs showed half of program attendance to be made up of that demographic. One program in particular consisted of 90% young Hispanic females that were from our local Girl Scout troop. • Our bilingual storytimes and scheduled tours with the Girl Scouts and [a nonprofit that serves Hispanic populations in the area] were successful in reaching historically underrepresented audiences in STEM fields. The Hispanic youth, their families, and the girls were educated and inspired in the program and with the exhibit. • We reached a group of school age children ages 5-18 who have been historically underrepresented in STEM Fields by low income African-America, Anglo-Caribbean and Latino youth. We were successful with providing hands-on STEM programming by partnering with an outside presenter. The exhibit was a total success. • In our application we identified the need to gear STEM programming in our community toward African American school-aged children from low-income families. We achieved our goal by encouraging regular afterschool students to attend programs as they were happening, and to visit the exhibit. We made sure to market the exhibit and programs in as many ways as possible including fliers in all library branches and neighborhoods, school visits, news articles, on our website and social media, and through our quarterly publication "Check Us Out" that is delivered residentially to 30,000 people in [the area]. While we did meet our goal, the attendance numbers were lower than expected, most likely attributed to the terrible winter weather the area experienced [while we hosted the exhibit]. We had to close the building twice due to snow, and cancel or reschedule several programs. • We attempted to reach our community's Hispanic population, as this is one demographic historically underrepresented in STEM fields and less likely to earn a degree in a STEM field. We published a description of the *Discover Space* exhibit in Spanish in the Spanish section of our bimonthly newsletter; had a Spanish language flyer available in the library; and had a Spanish program give a tour of the exhibit. At the Spanish language Family Fiesta, 51 families (80 individuals) explored the book *Planets/Planetas* which each family received a copy of. They also created their own planets that were displayed at the Spanish adult collection. Also, they visited the *Discover Space* Exhibit. An artist guided the families to make spaceships, aliens, and even minion-themed piñatas to take home. Along with the Family Fiesta program, we presented some bilingual space-themed programming including Out of This World Adventure! for children ages 3-6 with their families to explore space with stories, songs and crafts; Space Night program for kids entering grade 2 and up to have fun with stories, games, crafts and even making astronaut pudding; and a Spanish family picnic enjoyed by 83 people in which they had an outdoor picnic and made space chalk art. The Hispanic Space programs that were offered attracted more than 200 people. • One such audience was youth of color (African-Americans and Latinos.) We reached out to local schools, after school programs at parks, community centers and youth organizations. We also advertised on a local R&B music station. We were successful in pulling this population into the library to view and interact with the exhibit. As an added benefit, we were able to attract new visitors to this library. We were very successful in reaching children and families of color with the programs we conducted, as is evident from program and exhibit attendance statistics and surveys.

Audience	Examples *(while each example is shown within one audience category, some examples reference multiple audiences)*
	We were pleasantly surprised to see many African-American fathers attending programs with their children as that is not a common occurrence at this location. • We paid for school buses to bring kids from the afterschool program at [a local] elementary school, which is in a predominately Spanish speaking area of [the town], to the exhibit. We also hired [a staff person] to answer the children's questions in Spanish and English. We also hired him to docent our opening event for families as well, because he could explain the panels in Spanish and English. Bringing two busloads of students from an elementary school after school program in a Latino neighborhood to see the exhibit helped us bring Spanish speaking families into the library. We are planning to continue to bring programing and activities to the afterschool program at the elementary school. • This area sees a high concentration of Native Americans. We had a number of Native American families take part in the hands-on exhibit, hands-on events and the film we showed.
Girls/women	• We had several programs that specifically targeted girls and we feel that we were successful in reaching that audience. Of the 15 programs that took place at our library where the exhibit was hosted, more than 50 percent of the audience at any given program were girls or young women. We also presented engineering challenges based on the exhibit to 3 groups of girls (86 girls total) off-site. The teens from Girls, Inc. who were a part of one STEM education enrichment program were the main audience at two of our programs designed for them: a Women in Engineering panel held an Introduce a Girl to Engineering Day, and the Engineers without Borders program with female students from WPI presenting. • We were focused on involving girls in the exhibits and related programming. We featured women in engineering prominently in displays. For example, to encourage girls to see themselves as engineers, we created 50 signs depicting individual engineers which hung from the ceiling throughout the exhibit. We flipped the ratio of male and female engineers who stay in the field of engineering after the first few years, so that the majority of engineers pictured were women. Some were local engineers (who loved locating their pictures) and some were national figures. We extended the display by downloading TED talks by many of the featured engineers and offering the talks on a dedicated computer in the exhibit. Girls were particularly engaged in the hands-on activities in the exhibit, spending long periods of time doing the engineering challenges. Many returned again and again to revisit challenges. Yes, we were able to reach girls with our programs! Where our previous engineering/tech programs had a majority male attendance, most of our *Explore Tech* programs a balance of girls and boys. Meet the Robots, Twinkling Cards (paper circuits)/Elf Double Feature, and Dead Stars in 3D had equal, or near equal numbers of boys and girls attending. • We had a large number of young girls sign up for STEM-based programming centered around *Discover Space*. Historically, sign-ups for tech and maker-space programs has been dominated by boys. We hope this has been the start of a positive trend here.
Recent immigrants	• Our underrepresented populations—lower-income patrons and refugees—did attend some of the programs. We were encouraged by the participation during the family events, but realize we have more work to do to get these audiences involved.

Audience	Examples *(while each example is shown within one audience category, some examples reference multiple audiences)*
	Especially for our refugee audience, we felt that the exhibit itself might have been intimidating. With some of our refugee families, we know it is still a learning curve for them to discover that the entire library is here for their use. Within this audience, we saw more children than adults interacting with the exhibit, especially with some of the learning games…We will continue to try new STEM activities for these audiences.
Rural	• We definitely reached people in rural areas and living in poverty. School groups came from rural areas with small populations. • With [our] county having a very sparse population, [our library's] efforts to reach the rural schools was very successful. Students from [two elementary schools] traveled on field trips to [our city] to tour the exhibit and spend time interacting with the components. To reach all students in [our] county, [our library] created bookmarks to promote the exhibit with English text on one side and Spanish on the other. These went out to more than 9,000 students. While we had hoped to also create materials in Arabic for students, our contact from the community advised us it would be best to have the text in simple English that the children could translate for their parents. The circulation increase in space-science materials at all locations and on the bookmobile indicate our outreach was successful. The successful implementation of programs in [another community] and the rural schools that toured the exhibit indicate that [our library] was successful in reaching people who are geographically disconnected from STEM fields and underrepresented due to lower income levels. • As [our town] is a small-town community situated in an isolated rural region, the entire *Explore Tech* exhibition was essentially an effort to serve an under-served population. In that respect, we feel we were successful. More specifically, we attempted to target low-income patrons through the family visits from the Housing Authority. To promote the upcoming event, library director visited the Housing Authority's main office and spoke at tenants' meetings. Residents at these meetings heard a presentation about *Explore Tech*, saw a demonstration of the Cubelets robot, and were invited to attend the event. Feedback from attendees was highly positive, and community partners who assisted with the event's organization stated that they considered the event a success.
Individuals with special needs	• One group we did not target intentionally but we reached successfully was special needs students. We have hosted library tours with a group from the local high school before, so I should have thought to invite them. Happily, they contacted us and requested a field trip. Their visit was incredible. The teachers worked with small groups of 2-4 students and did nearly every activity from the tub, and they discussed each panel. It was amazing. • Given that the branch is in walking distance to the [State] School for the Deaf, this helped us reach out to the deaf community in [the area]. • Another underserved group that we did not originally plan to target consisted of adults with physical and intellectual disabilities. During the time we hosted *Explore Tech*, the directors of the County Skilled Workforce Center contacted the library about scheduling visits with their clients, many of whom have such disabilities. The library worked with them to schedule a series of visits that proved well-attended and highly successful. We feel that to the extent that our programs succeeded at all, we

Audience	Examples *(while each example is shown within one audience category, some examples reference multiple audiences)*
	were indeed successful in reaching audiences (lower-income families, rural students, adults with physical and intellectual disabilities) underrepresented in STEM fields.

Source: ALA Final Report from 60 libraries

Although almost all the libraries reported that they were successful in reaching at least one underrepresented audience, about 20% of the libraries said that they were less successful than they had hoped at reaching one or more of their underrepresented audiences. Libraries cited different reasons for having for lower turnout than hoped.

Two libraries said that reaching the audiences they planned to serve (lower-income families and recent immigrants, respectively) required more staff time for outreach than they ended up having available:

> "We were hoping to reach out to our more poverty line families. I don't think we did that as well as we could have. However, through our day care and school visits we definitely did tap that audience some….To reach our underrepresented low-poverty group that I was hoping to, we would have needed to take the discovery table/kiosk to them where they live. I just did not have time or manpower to do that. Fall was much busier than anticipated, and so I was unable to do as much with this as I would have liked." (Library 1)

> "Our efforts were minor and we did not fulfill this part of our goals. The people who had planned to be the leaders in this effort were no longer available and staff did not find enough time to take that part over. We were not successful in reaching the new immigrant populations (Somali, Karen and others) that we had planned on. This was a fallout of losing the primary volunteer who was to spearhead this part of the project and the time constraint of having library staff take over this area. Loss of this volunteer impacted other planned programs with some collaborators." (Library 2)

Another library was not successful in providing programming for girls because of difficulties coordinating with an external partner:

> "We had planned to reach out to girls and encourage them to learn more about STEM. Our plan to work with the Girl Scouts fell through…We were not successful in reaching our choice of historically underrepresented audience of girls in STEM. Our main girls program did not get out of planning due to issues with presenters. We did do well in identifying and getting female speakers who do work in the STEM fields so it was nice to know that they do exist out there and that they did enjoy coming to our library. We made great contacts with them and hope to have them back in the future."

One library said the *STAR Net* exhibit coincided with another project and the two programs competed for the same group of lower-income library patrons:

> "What impacted our ability to reach out to undeserved population was another grant we received, for the same time period. This wasn't expected, so we were kind of competing with ourselves. This other grant offered a meal. We did have positive numbers with attracting girls into the science programs."

A library was hoping to reach Hispanic and refugee populations. However, they hosted the exhibit in the summer when transportation for many of these youth was not available:

> "The time frame for the exhibit was difficult for us, as school was out and partners that bus their youth to events were on a different schedule for the summer. We did announce the exhibit to our partners in the Refugee Service Providers meeting, as well as our partners in the refugee resettlement agencies…We continue to examine the best way to reach the Hispanic and refugee populations, and bring them in to the library. This is an area in which we have been less successful than we'd like."

Finally, one library said they were unable to get most of the schools in their rural area to send their students to visit the exhibit, in spite of the transportation costs being covered by a business partner:

> "The library was not successful in its attempts to get area or rural schools to visit the exhibition. Walmart was on board to provide the funding for transportation costs. Only one school took advantage of the invitation.… The library was successful in contacting six school district superintendents and principals of the rural and local schools. However, …only one school took advantage of the invitation. It was disappointing. Total attendance was lower than we would have liked, and appeals to pay for bus transportation were not acted upon. It seems that schools are very busy with their own curriculum guidelines and are less likely to want to venture out beyond their buildings. Many attendees were from the low-income, subsidized apartments located right behind the library, so we know that some of them were exposed to the exhibition."

Similarly, during a site visit, another library described reaching out to area public schools and getting little interest.

It is important to note that although some libraries said they were less successful than hoped in reaching particular underrepresented populations, almost all still reported at least partial success in reaching either these or other underrepresented populations.

✓ **Indicator:** *STAR Net* Host Librarians reach new audiences through programming provided during the exhibit

In interviews and in response to open-ended questions, many libraries reported the exhibit helped them attract new patrons, including more families, fathers, homeschoolers, and children and adults with special needs. As one librarian said, "We had a lot of new patrons that came for the programs and exhibit. We gave out many new library cards." Another librarian said:

> "One observation we had not anticipated is that we've had a lot of engagement from young boys. It was our mission to reach out to girls and women. We have done so, but we also sometimes struggled with attendance with younger males. We've had a strong engagement and had comments from their parents about how they are excited."

When one librarian was asked if the visitors coming to see the exhibit or to attend programs were typical of those who come to the library, she responded "yes and no." She explained:

> "A lot of our regular patrons have come in to look at displays and to come to different events. But we've actually had a huge number of families and children we've never seen before. [One of our library staff] was able to get funding to get schools to come here and look at the displays. Most of

these students didn't have library cards. We made them cards and introduced them to the library and to space at same item. There's been a huge upswing in people haven't seen. We're seeing more Latinos, who are a large percentage of our population, which I think is really good. That partly is because of the schools we targeted to get here. I think there's been an upswing in home-schooled kids, too."

Other libraries were able to engage existing patron in new ways. For example, on site visits, two parents who have children with special needs described how the exhibits provided uniquely engaging ways to help their children to learn.

> "My son and I come to the library on Tuesdays and Thursdays. He has been diagnosed with learning disabilities and receives occupational therapy in town. We stay in the library because there's a gap between the time we finish doing homeschooling activities and when he has his [occupational therapy] appointments. After he's done with school, there are things he can play with. It gives him a break. He loves it. Loves it! Even though he doesn't know how to read…he loves coming here. He remembers the questions on the Quiz Game. He goes home and talks about it. We are currently working on history and science. The topics in the exhibit are perfect for us. For example, the weather and mapping hurricanes. So perfect! I brought my daughter today. She's gotten to the age where she's too cool for school. She's enjoying it, too. It helps me out. Instead of just telling him, it's more hands-on. We're very crafty. It gives him good ideas." (Parent 1)

> "We come to the library every day. My daughter loves it. She has been diagnosed with ADHD. When I saw her doing the green screen weather forecast [part of the *Discover Earth* exhibit] with her friend from school and I found out that the videos aren't saved, I recorded it on my phone. This is the main way we do science. She can learn by doing." (Parent 2)

Librarians were pleased that they had reached new patrons or existing patrons in new ways. In fact, the majority of the host librarians (74%) reported that the exhibit was "very successful" at their library. Most of the remaining librarians (21%) said the exhibit was "somewhat successful."

Table 16. View of *STAR Net*'s Success

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.	**All Respondents (n = 91)**	***Discover* (n = 34)**	***Explore* (n = 57)**
Very successful	74%	77%	74%
Somewhat successful	21%	23%	19%
Neutral	2%	-	4%
Somewhat unsuccessful	2%	-	4%
Very unsuccessful	-	-	-

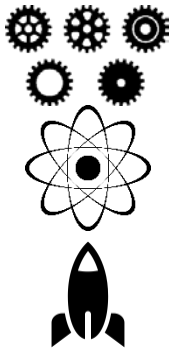
Source: Library Staff Six Month Post-Exhibit Surveys

Librarians were invited to explain their answers. Library staff said their communities benefited from participating in *STAR Net* in several ways (see Table 17 on the following page). Library staff said the exhibit and associated training enabled them to reach new audiences, that patrons were excited to have the exhibit and associated programming in the library, and that it shifted patrons' perception of the library from a static

institution that only lends books to a dynamic institution that offers fun and interesting things to learn. Library staff also said their participation in the project fostered new partnerships and inspired them to offer more STEM programming in the future.

Table 17. Librarians said their libraries and communities benefited in multiple ways from participating in *STAR Net*.

Benefit	Examples from Library Staff
Received positive feedback from patrons 	• We had student field trips from as far as 1 ½ hours away come to the exhibit as a field trip. People around town are still talking about the exhibit—how much they learned, how amazing it was for our small town children. They are also asking what/when are we going to do it again! • Patrons are still mentioning the various programming we provided with the exhibit. • We still have parents and children bring up the exhibit and mention that they learned something from it. • We still have people coming to the library looking for the exhibit. Even just a few weeks ago we had a family come to the library and ask where the exhibit was. We also have people telling us stories about coming to the library and seeing the exhibit, and how much fun they had. All of the reactions have been positive and the community response has been great. It seems like everyone liked it and we have been asked to have similar exhibits in the future.
Developed partnerships 	• The exhibit was great, especially in improving our connection to local school systems as many of them came for field trips. This connection has sustained us into being included in discussions of STEM development in our local school systems. • The exhibit really helped increase collaboration with other local organizations that had not collaborated with the libraries in the past. • The exhibit helped us in many ways. We created some new partnerships with area organizations and strengthened others. We greatly improved our non-fiction collections for both adult and children's in science and earth science subject areas. We continue to offer STEM-focused programming that is generating interest among all ages. And the exhibit helped us build a brand as a STEM organization.
Reached large audiences, including new patrons and patrons from underrepresented groups 	• We had large numbers of patrons visit the exhibit in the library and we've seen an increase in STEM programming attendance. • The exhibit brought in many people who had never come to the library before, including people of influence in the community. • Since most of the residents living in proximity to the exhibition site are at the lower ebb of the socioeconomic strata, the ability to showcase such an unusual and rare exhibit provided and an opportunity and easily access to a wealth of information that would not have been possible otherwise. In fact, having the exhibit here provided schools—elementary through college students—with educational and scientific information regarding space and our solar systems for homework and research purposes.

Benefit	Examples from Library Staff
Changed patrons' perception of the library as a place with more than books 	• The exhibit met our goals of engaging the community in STEAM topics. The exhibit drew customers' curiosity. If they didn't interact with the exhibit directly, they approached the librarians to ask for more information about it. It added to the experience of visiting the library, moving the library from a passive place you visit to select a book, to an active place where you engage and participate in activities. This touch point for interaction was appreciated by staff and customers alike. • We had a noticeable increase in the number of families who visited the library. Also, it showed the public that our library offers more than just books. • Hosting the exhibit seemed to spark an interest in science-related programs in our community, and it appears to have positioned our library as a trusted provider of these resources. We are enjoying continued interest, attendance, and participation at many of our events.
Inspired library staff to offer more STEM 	• The exhibit was so popular that, well after the exhibit was completed, we were getting requests for tours of it. The exhibit brought in many new users to the library and helped us build our STEM collection. It also inspired staff to continue to conduct monthly STEM programming, including coding and snap circuits. • A lot of people came into the exhibit, and we got a lot of positive feedback. We also started to implement more programs around the material that was given to us as a part of the exhibit (i.e., Keva planks). • The exhibit encouraged us to provide more STEM programming, which was very successful. Since then, we've engaged in continuing STEM programming for youth. • The exhibit got my library kids excited about earth science. It also made me think about programming for my afterschool in a different way (introducing more science concepts).

Source: Library Staff Six Month Post-Exhibit Surveys

Library staff who rated the exhibit as "somewhat successful" most often said they wanted to have more time to plan programming (cited by a few libraries that hosted one of the exhibits early in the tour), were disappointed by lower than expected levels of attendance, or found the exhibit less engaging than expected (due to malfunctioning computer kiosks or wanting more hands-on activities). Examples of library staff's comments include:

- "The exhibit initially created an excitement in our community but technological difficulties worked against it. In time the public ignored the exhibit."
- "In general, the programming and exhibit itself was successful. However, we did have one station that would not work the entire time we had the exhibit."
- "We had a lot of traffic with the exhibit. We were hoping for more numbers with our adult programs though."
- "I think we could have done a better job both in advertising the exhibit and in having staff or volunteers available to accompany visitors through the exhibit. There was a considerable amount of

reading involved with the displays, and I think many of the children (and others) who visited don't like to take time to read and learn how to best interact with each display."

- "Most of the time the interactive computer did not work. I think it would have been used more if we had placed it nearer the children's department. Adults were not interested. People enjoyed reading and seeing the display panels."
- "The exhibit itself was kind of underwhelming. I felt like the design of the panels could have been more kid-friendly and more colorful; the washed out gray color was drab. The accompanying activities were in unusable shape by the time we received them. The exhibit did inspire the Youth Services staff here to create their own activities and programs to accompany the display and those were very popular."
- "The exhibit helped to foster interest in our youth services librarians in doing more STEAM programming. It was the programs themselves that we did in conjunction with the exhibit that fostered the interest. The exhibit was kind of static because only a limited number of kids could use the hands-on materials that were provided. Some comments that have been made were that it would have been more interesting if each panel had an interactive element rather than just an informational panel."

Two librarians (2%) rated the exhibit as "neutral." One of them explained, "The response about the exhibit was positive from patrons. From the staff side, we were disappointed in the things included as activities. We also felt the exhibit was not geared to the promoted and targeted age." The other respondent who gave a "neutral" rating explained they had moved to a different library and were unable to comment on the success of the exhibit.

Two librarians (2%) from the same library thought the *Explore* exhibit was "somewhat unsuccessful" at their library, largely because they did not have the attendance they had expected. One of the library staff explained:

> "We did not get the local support from patrons and the local schools that I had hoped for. The schools that viewed the exhibit came from surrounding towns, most from a single town. The teachers locally said they did not know about the exhibit even though information was sent to the schools and was advertised locally. Some patrons did not view the exhibit even when in the library and encouraged to do so. We did get good feedback from some who viewed and were wowed that we had been chosen, but they were a small number. Our scheduled programs were sparsely attended, some had no attendance, and it didn't seem to matter the day/time of the program."

Question 4: To what extent do library patrons at the Phase 2 host libraries become more interested in, knowledgeable about, and engaged in the STEM topics presented in the exhibits and related programming?

Many library patrons at the host libraries became more interested, knowledgeable, and engaged in the STEM topics presented in the exhibits and related programming. Library patrons found the exhibits and related programming to be highly engaging: they spent time interacting with the exhibits, attended programming, and reported that they found the exhibits to be very interesting. Many patrons became more interested and more engaged in STEM topics.

✓ **Indicator:** Library patrons spend time engaging with exhibits

According to library staff, 1,106,344 visitors had seen a *STAR Net* Phase 2 exhibit through July 2018. A total of 803,489 individuals had attended a *Discover* exhibit, and 302,855 individuals had attended an *Explore* exhibit. Library staff reported that, on average, about one out of three library visitors viewed a *Discover* exhibit and one out of four library visitors viewed an *Explore* exhibit.

The attendance figures should be considered as estimates rather than exact counts. Librarians were asked to explain the source of their visitor statistics. Almost all the librarians said they had estimated the number of visitors because the exhibit components were scattered throughout their libraries and it was therefore impossible to track the exact number of library visitors who had looked at one or more parts of the exhibit.[7] Library staff used a variety of methods to track exhibit visitorship, including conducting periodic head counts, using sign-in sheets or a guestbook, counting completed Patron Surveys, and counting patrons who attended exhibit-related programming (although a few libraries explicitly chose not to include patrons who visited programs in their exhibit visitor count). Because the exhibit components were typically placed in multiple locations throughout the library (including prominent locations such as at the library's entrance or near the circulation desk), some librarians assumed that all or almost all of the people who came to their library during the exhibition period also spent time interacting with the exhibit. One of these libraries explained:

> "We had no specific way to distinguish between patrons entering the library to visit the exhibit and patrons entering the library for another purpose. Many patrons who entered the library for another purpose did take time to read the screens or touch the meteorites. You could not [help but] see the exhibit as you entered the library. It was front and center."

[7] At least three libraries placed the exhibit in a separate room, and all three used an automatic people counter to track exhibit attendance. However, one of these libraries discovered that the door counter was malfunctioning partway through the period it was hosting the exhibit.

However, other libraries estimated that between 10-50% library visitors viewed the exhibit. One of these libraries said:

> "We found this to be difficult to determine. On days when we had programs related to the exhibit, staff reported seeing patrons interact with the exhibit before or after the program. The exhibit is in a well-used thoroughfare of the library, so many patrons saw the panels and kiosk but it is more difficult to determine to what extent their engagement was. We previously used 25% of the gate count for a different exhibit to determine the number of visits and decided to apply the same calculation for [the *STAR Net* exhibit]."

Several librarians commented that the numbers they reported probably underestimated visitorship. One librarian said, "It was difficult to get an accurate count. I am sure some people stopped at the exhibit and were not included in the count. The count indicated in this report is the minimum number of visitors." Another librarian said:

> "We were unable to find any practical way of counting all individuals who examined the exhibit, and so have counted only total program attendance. We know that we observed patrons going to see the exhibit on a daily basis apart from regular library business. But the staff's preoccupation with attending to regular library business limited interaction with exhibit attendees outside of formal program events."

Although the exhibit placement may have hindered the ability to track visitorship accurately, it may have also (and more importantly) made it more likely that library visitors would interact with at least part of the exhibit. The scattered placement of exhibit components fostered serendipitous exploration of the exhibit. As one librarian explained, "If we could have sectioned off the exhibit, we'd have better accuracy of the numbers of visitors; however, that would have also made people less inclined to visit."

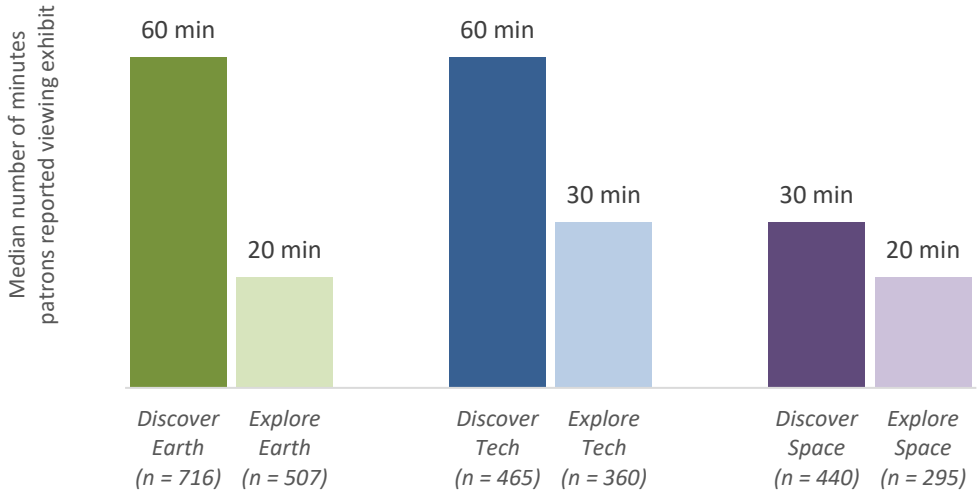
Self-reported data from patrons and observational data of patrons indicate that patrons spent more time looking at the *Discover* exhibits than they did looking at the *Explore* exhibits. This result is not surprising given that the *Discover* exhibits had a greater number of components than the *Explore* exhibits.

The Library Patron Survey asked attendees to write in the number of minutes that they had spent looking at the exhibit.[8] If patrons had attended the exhibit more than once, they were instructed to add the total the number of minutes they had looked at the exhibit. (The survey did not list specific answer choices so as not to unintentionally bias visitors' time estimates upward or downward.) Patrons' responses were subsequently grouped into categories for analysis based on the distribution of responses.

[8] A total of 78% of patrons answered the question. Caution must be exercised in interpreting the Patron Survey results because a very small percentage of patrons who viewed the exhibit or attended exhibit-related programs completed surveys. A total of 3,541 Patron Surveys were received from the estimated 1,106,344 visitors (which does not include all the patrons who attended programs). Patrons who completed the surveys may not be representative of the majority of exhibit visitors and program attendees.

Discover patrons reported spending more time looking at the exhibits than *Explore* patrons (see Figure 14 below). On average, *Discover* patrons reported spending 60 minutes and *Explore* patrons reported spending 25 minutes looking at the exhibit ($p < .001$). Overall, 64% of *Discover* patrons and 35% of *Explore* patrons reported spending more than 30 minutes looking at the exhibit.

Figure 14. *Discover Earth* and *Discover Tech* patrons reported spending the most time looking at the exhibits, with the average patron reporting they had spent a total of 60 minutes looking at the exhibits. *Explore* patrons tended to spend less time looking at the exhibits, reporting they spent an average of 20-30 minutes, depending on the exhibit topic.

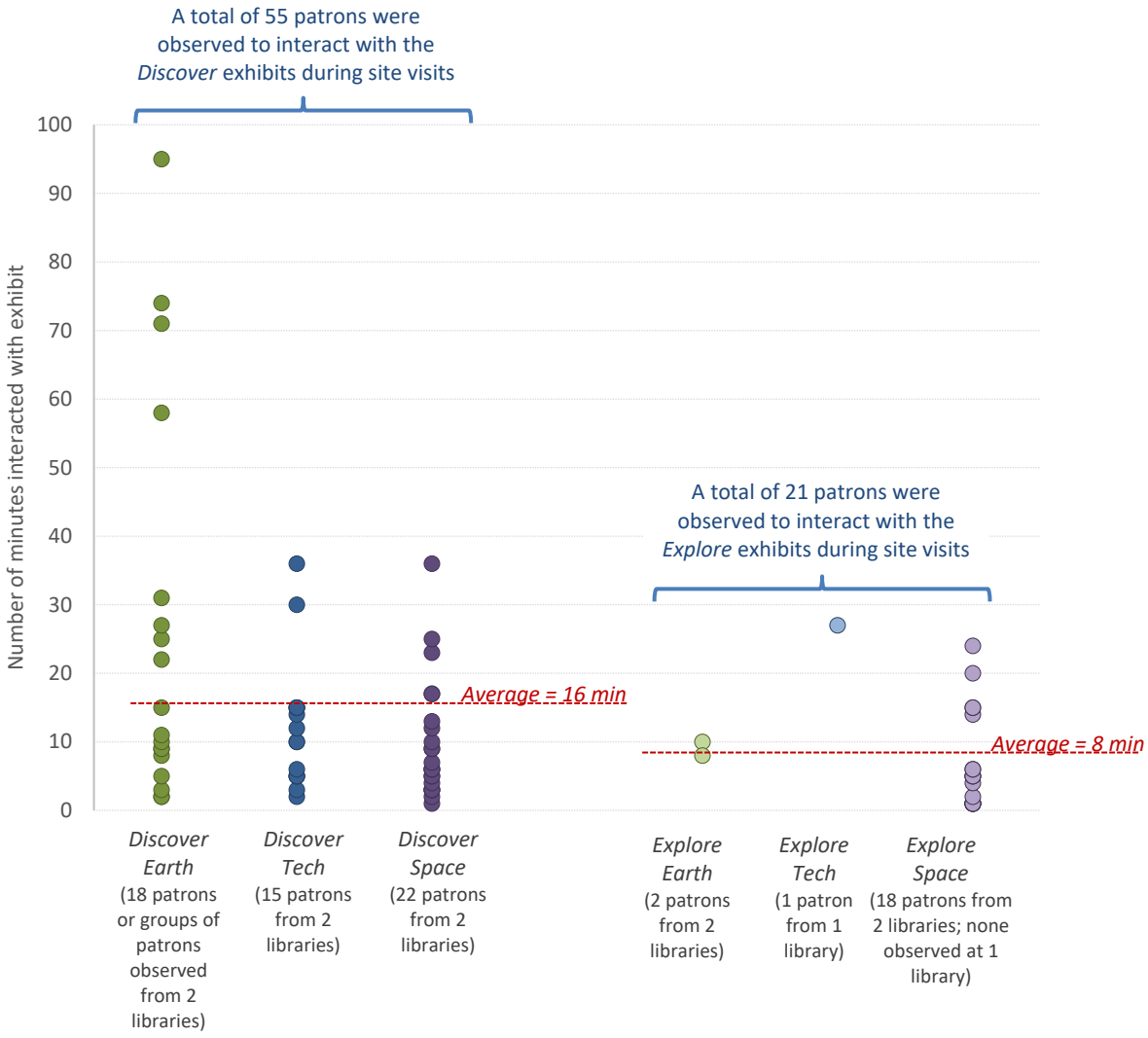


Source: Patron Surveys

Patron observations at a sample of library site visits corroborate patrons' self-reports. More patrons were observed to spend time interacting with the *Discover* exhibits than with the *Explore* exhibits, and patrons spent more time visiting the *Discover* exhibits than they did the *Explore* exhibits.[9] During site visits to six *Discover* libraries and six *Explore* libraries, more than twice as many patrons were observed spending time looking at or interacting with the *Discover* exhibits for any amount of time compared to the number of patrons who were observed viewing the *Explore* exhibits: 55 patrons were observed to interact with the *Discover* exhibits while 21 patrons were observed to interact with the *Explore* exhibits (see Figure 15 on the following page). The average patron was observed to interact with one of the *Discover* exhibits for 16 minutes (range of 1-95 minutes), while the average patron was observed to interact with one of the *Explore* exhibits for eight minutes (range of 1-27 minutes).

[9] The evaluation team spent one to two days at each of six *Discover* libraries and six *Explore* libraries observing patrons as they interacted with the exhibits. A total of 55 *Discover* patron observations and 21 *Explore* patron observations were conducted; some of these observations were of multiple individuals in small groups, such as families.

Figure 15. During site visits, more than twice as many patrons were observed spending time looking at or interacting with the *Discover* exhibits for <u>any</u> amount of time compared to the number of patrons who were observed viewing the *Explore* exhibits. On average, patrons spent 16 minutes with the *Discover* exhibits, while patrons spent 8 minutes with the *Explore* exhibits.

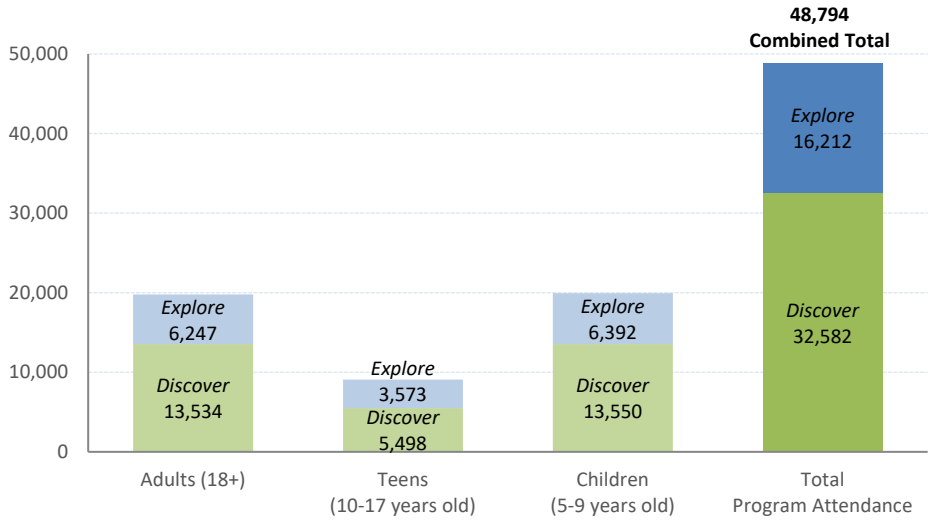


Source: Patron Observations at 12 *STAR Net* libraries; each of the six exhibits were observed at two libraries with one exception: 3 *Explore Space* libraries were observed and only one *Explore Tech* library was observed

✓ **Indicator:** Library patrons attend library programs associated with the exhibits

Librarians were asked to track the number of individuals (by age) who attended each of their exhibit-related programs. A total of approximately 48,794 individuals attended programs, including more than 29,000 children and teens.

Figure 16. A total of 48,794 individuals attended exhibit-related programming. About 40% of program attendees were children ages 5-9 years old.



Source: ALA Final Report form; 60 libraries

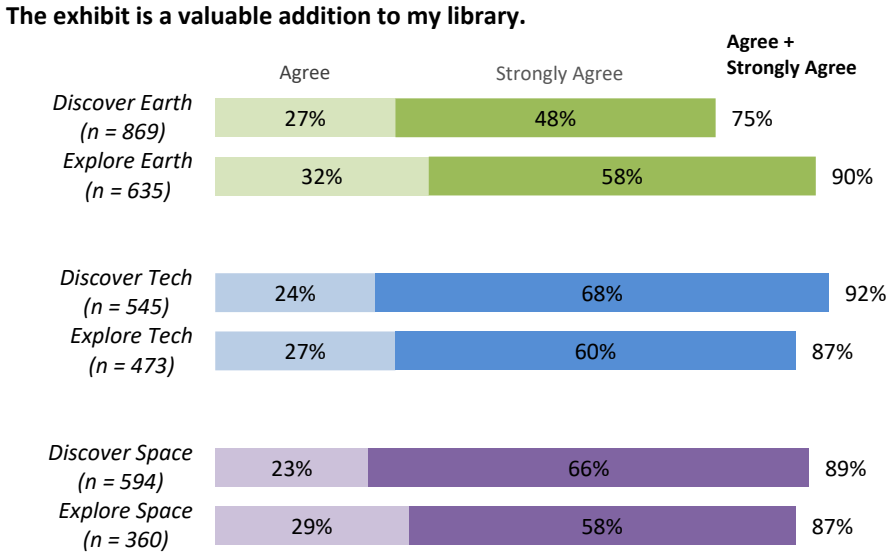
Three quarter of patrons who completed a Patron Survey reported that they had attended one or more programs, lectures, or presentations related to the exhibit at their library (69% of the *Discover* patrons and 79% of the *Explore* patrons).

✓ **Indicator:** Library patrons engage with the exhibits and programs express excitement during exhibit interaction

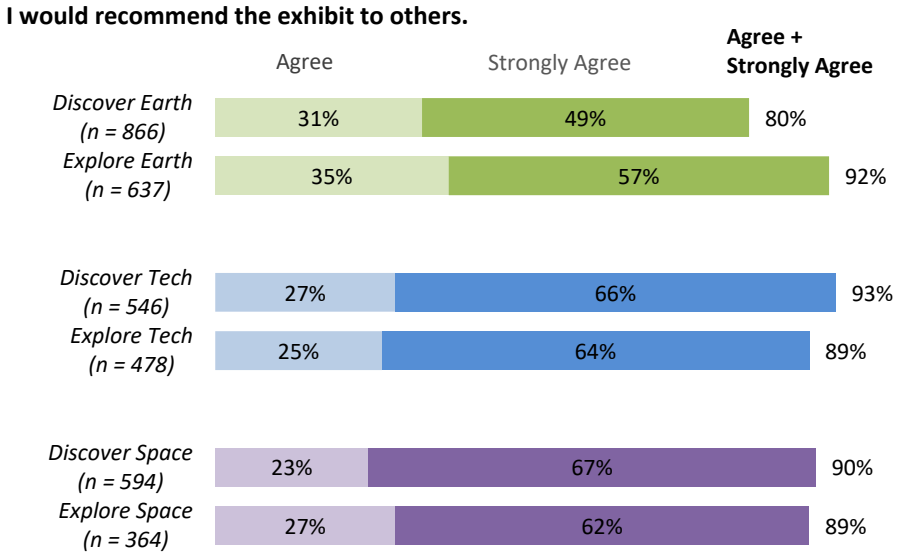
Patrons who were interviewed during site visits to 12 of the *STAR Net* libraries were very positive about the exhibit and said it was a great addition to their library. Most said that they would recommend the exhibit to their friends or family members, and several said they planned to bring their children or grandchildren back to the library to see the exhibit.

The vast majority of survey respondents were also enthusiastic about the exhibits (see Figure 17 below). The majority of patrons agreed or strongly agreed that the exhibit was a valuable addition to their library and that they would recommend it to others. Survey respondents who had children with them also agreed that their children were very interested in the exhibit.

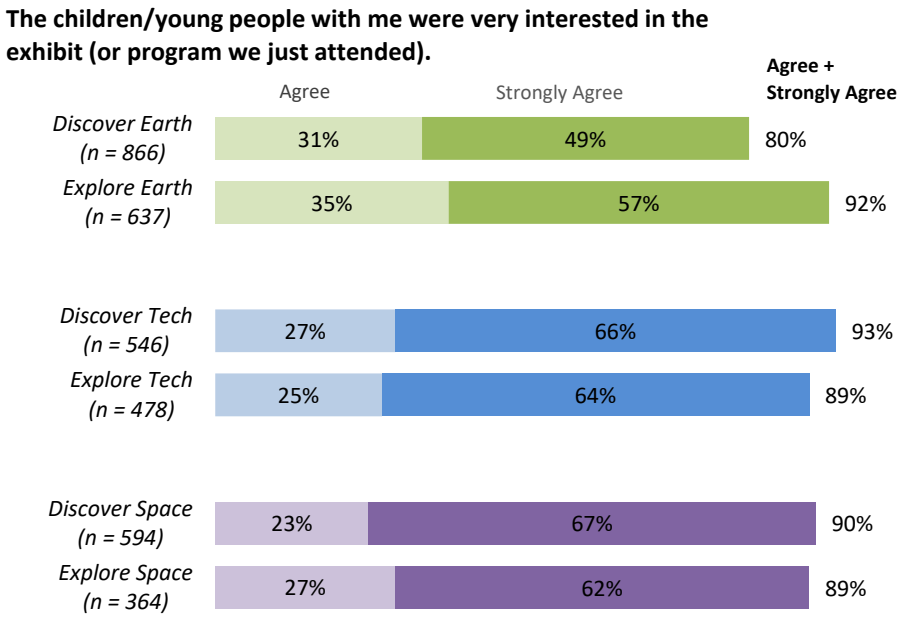
Figure 17. The majority of patrons were enthusiastic about the exhibit**.**



Source: Patron Surveys



Source: Patron Surveys



Source: Patron Surveys

Visitors said the exhibits were interesting, engaging, and unique. They especially valued the hands-on nature of the exhibits. In interviews, patrons commented:

- "I think it's awesome."
- "It's the best I've ever seen [at this library]. Usually they have quilts or something."
- "I haven't looked at a lot of the [*Explore Space*] exhibit [panels], but the computer is really cool. I'd like to have the app for that! It's so cool. It speeds up what's so slow to us."
- "It is very professional—like a real museum."
- "My daughter loves it here. We have been at least three times so far. We love it! We did the Quiz Game three times so far today, but her favorite is the Inventor's Lab [a hands-on station that is part of *Discover Tech*]."
- "It's fun and a great idea! It is a good way to get kids involved outside of school. The hands-on science is great for 'accidental' learning."
- "You learn but you get to play games."
- "I learned that engineering is fun! I am thinking about becoming one—a computer engineer."

Library staff thought that the exhibits—especially the interactive components—served as a powerful draw for children and adults. Librarians commented:

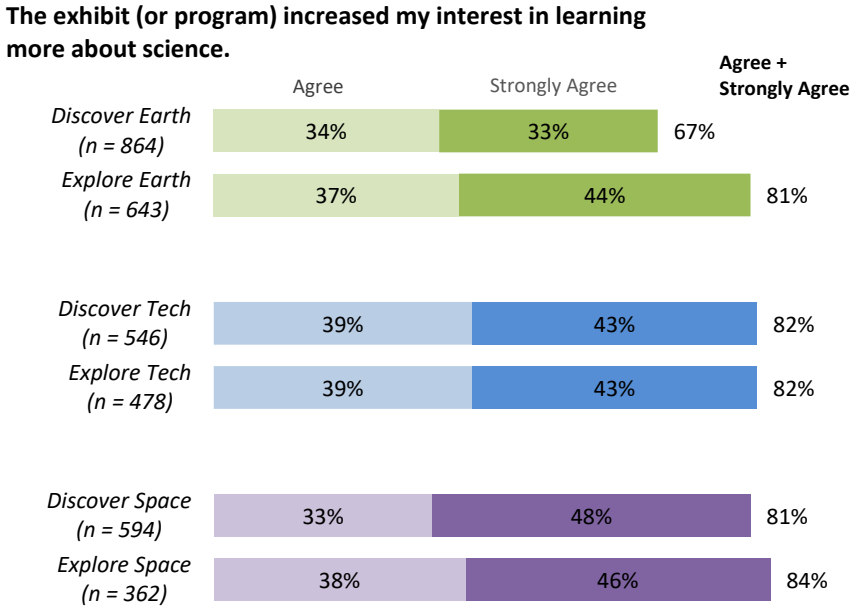
- "It was and remains the talk of the town. People often ask if there's a chance the exhibit could come back or if we might be able to get something as 'equally awesome' in the near future. Finding this has proven to be difficult! It's hard to surpass what we accomplished with this exhibit."
- "People are really interested in science. I've been interested to hear conversations that have started because of this. I think it's been a really positive experience for our patrons. I've had a couple patrons outside of the library who know me or recognize me from the library. If they know I'm from the library, they'll talk about programs we've had…There was a debate between some teens looking

at Post-It notes about what the next conversation we should have [as part of a teen program]. The interactive has been positive for a lot of people. It makes them feel part of the conversation, too."

✓ **Indicator:** Library patrons indicate that the exhibit or program increased their interest in learning more about the exhibit topics

One of goals of *STAR Net* is to increase the likelihood that library patrons become active science learners as a result of attending the exhibit and/or related programming. As shown in Figure 18, the majority of patrons who responded to the Patron Survey agreed or strongly agreed that the exhibit increased their interest in learning more about science.

Figure 18. The majority of patrons said the exhibits increase their interest in learning more about science.



Source: Patron Surveys

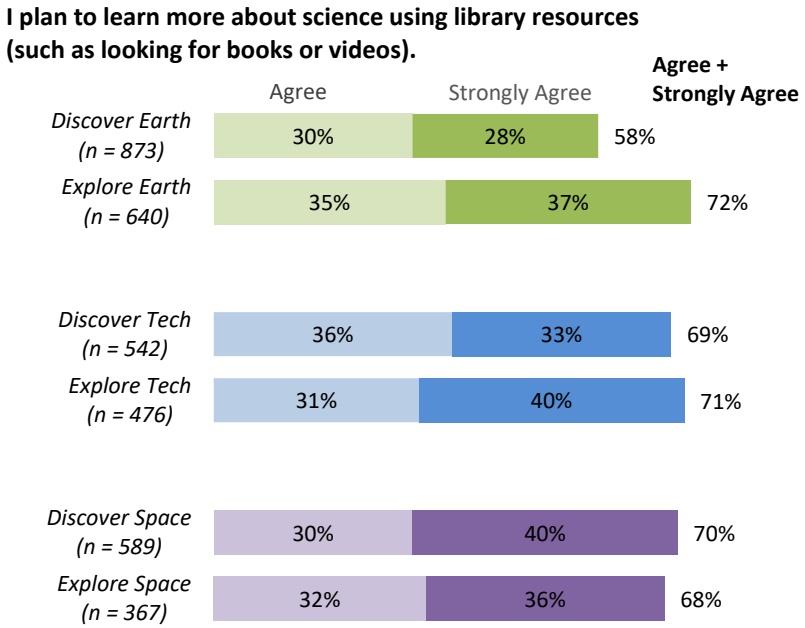
In interviews, library staff said patrons were excited about the programs and expressed interest in learning more about STEM.

- "We definitely saw kids especially getting excited about the hands-on activities. It seemed to spark curiosity and a desire to learn."
- "They really, really enjoyed it. The children still talk to me about the different toys that they were able to explore and how much fun they were."
- "We have seen an increase in our STEAM programming attendance and we have had school field trips booked by classes that attended the *Explore Space* exhibit and want to return to the library for a similar interactive experience."
- "We already see a high interest in STEM programs, added two ORION telescopes for patron check out which are HIGHLY used and WILDLY popular. *Explore Space* kindled curiosity and library presentations/supporting materials have garnered positive feedback."

✓ **Indicator:** Library patrons borrow library materials to learn more about the specific idea(s) presented in the exhibit and increase the number of STEM library resources checked out after the exhibit

Another *STAR Net* goal is to increase library patrons' interest in learning more about the subject matter of the exhibits. The Patron Survey asked exhibit visitors if they planned to use library resources to learn more about science. More than two-thirds of the patrons said they intended to do so (see Figure 19 below). Although the majority of patrons said they planned to learn more, it is noteworthy that of the nine survey questions asking patrons' about their interest, attitudes, and dispositions toward the exhibits and STEM, this question received the lowest percentage of agreement.

Figure 19. The majority of patrons said they plan to learn more about the exhibit topics.



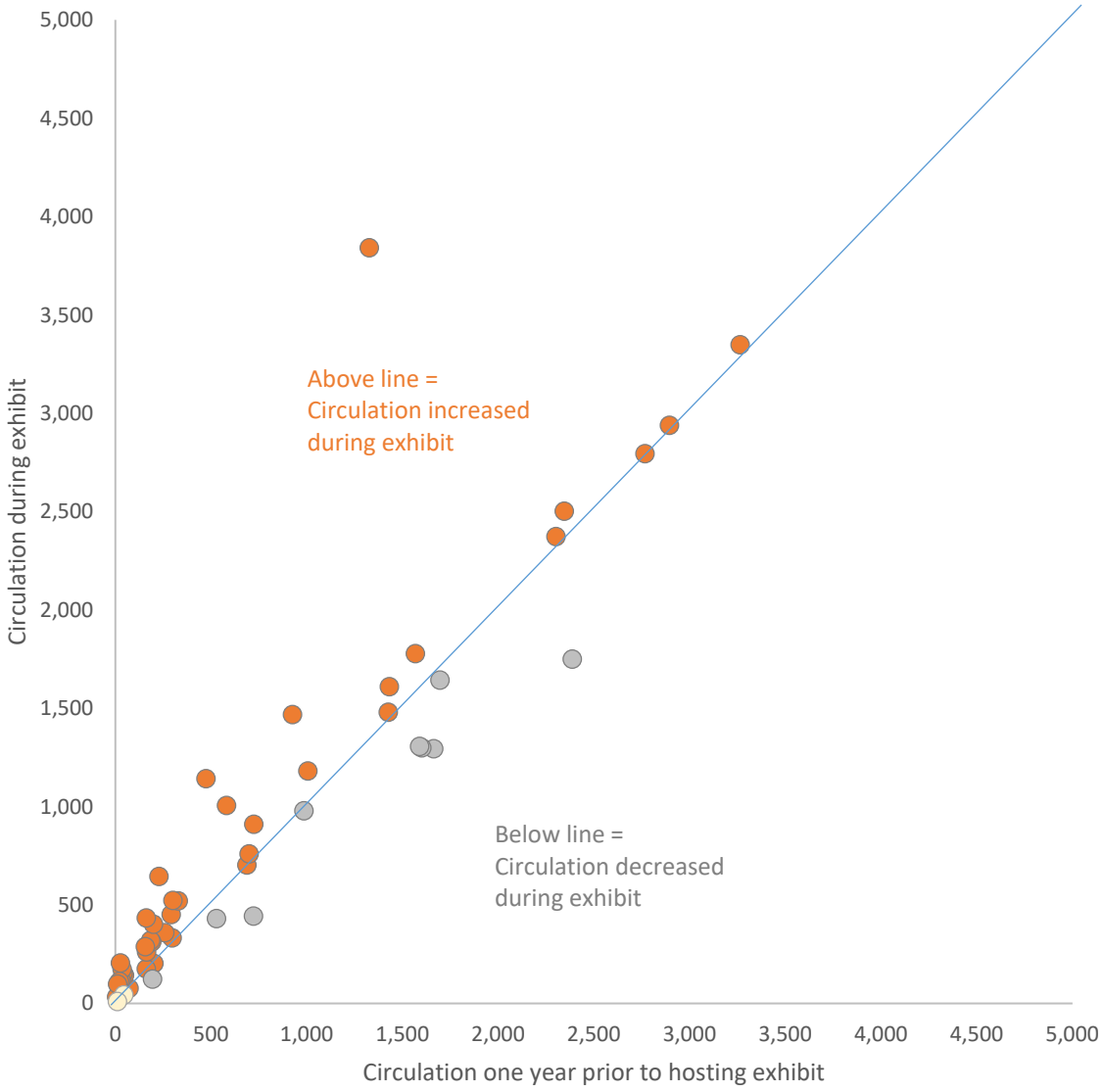
Source: Patron Surveys

As a proxy for measuring changes in patrons' interest in learning about STEM, exhibit-related circulation records were collected from exhibit libraries for a two-month period one year prior to each library receiving the exhibit, and the two-month period while each library had the exhibit.[10] More patrons checked out STEM-related materials during the exhibit than they had the year before from 44 out of 56 libraries (79%) that provided circulation records. (Ten libraries had declines in exhibit-related circulation and two libraries had no change.)

[10] Records were also collected for the equivalent period one year after the exhibit has left each library. A total of 25 libraries provided these records. However, some of the libraries' one-year circulation statistics were dramatically different from either their baseline or during exhibit circulation statistics. For example, one library had previously reported that they had circulated 1,326 items one year prior to hosting the exhibit, but only circulated 354 one year after the exhibit; they did not provide an explanation for the apparent dramatic reduction. A few other libraries provided data that seemed inconsistent with the baseline or during exhibit numbers. The one-year data were determined to be unreliable and are not included in this report.

A total of 24 *Discover* and 32 *Explore* libraries provided records for the period before they hosted the exhibits and while they hosted the exhibits. The average (median) *Discover* library circulated 55% more materials related to the exhibit they were hosting, and the average *Explore* library circulated 13% more materials while the exhibit was at their library. However, this average disguises considerable variation by library. Year-to-year circulation patterns for the 56 libraries that provided records ranged from a decrease of 38% to an increase of 800%. Although circulation varied by library, the majority of libraries reported that they circulated more STEM-related materials while the exhibit was at their libraries: 83% of the *Discover* libraries and 75% of the *Explore* libraries that provided records reported increases in the number of exhibit-related materials that circulated while the exhibits were at their libraries.

Figure 20. Exhibit-related circulation rose at most libraries while they hosted a *STAR Net* exhibit compared to the equivalent period one year prior.



Source: ALA Final Report form; 54 libraries (Figure omits two libraries with >30,000 circulation)

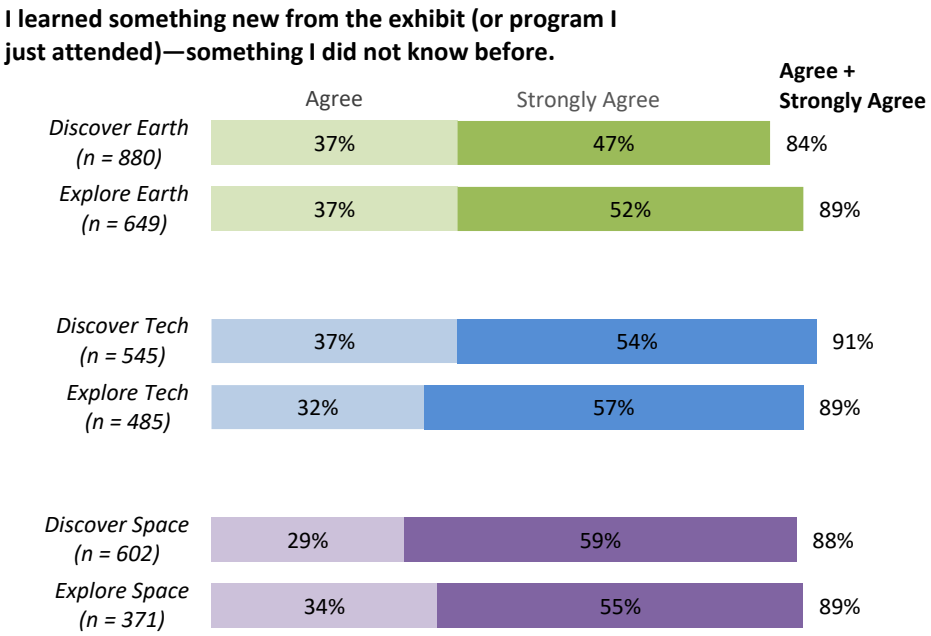
The majority of libraries promoted exhibit-related materials to patrons while they hosted the exhibit, such as temporary displays of books or DVDs located near the exhibits. A few libraries purchased additional exhibit-related materials for patrons to check out. At least two libraries made a list of STEM books and DVDs available at the library for patrons. Several libraries also promoted science fiction books or nonfiction materials that were not included in the circulation statistics reported above.

✓ **Indicator:** Library patrons report increased knowledge in *STAR Net* exhibit topics:

- indicate that the exhibit or program increased their awareness of the exhibit topic
- recall topics and ideas presented in the exhibit or program
- understand one or more of the exhibit's key themes and have met one or more of the exhibit's learning goals

Patrons said that the exhibits increased their knowledge of earth science, technology or space. About nine out of ten patrons agreed or strongly agreed they learned something new from the exhibits or the exhibit-related program they had just attended.

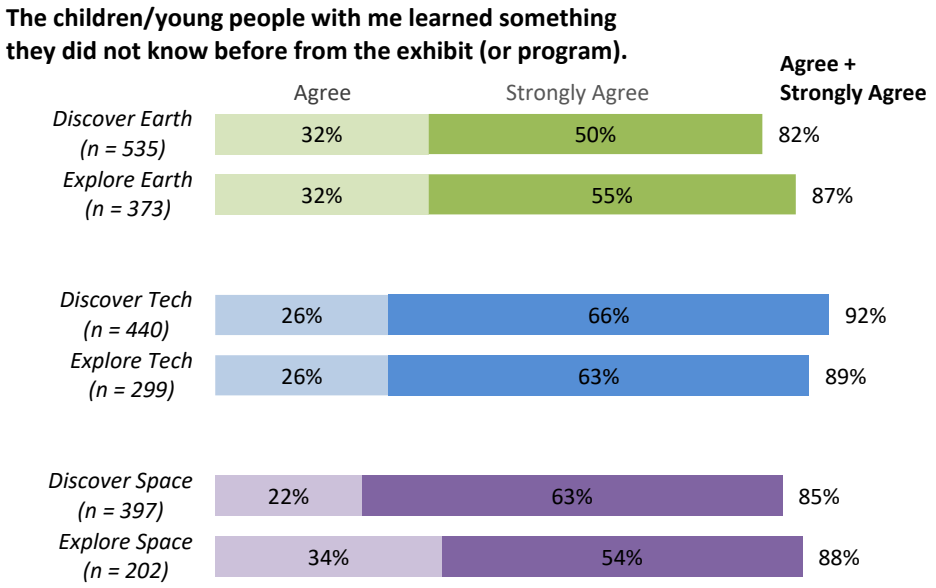
Figure 21. The majority of patrons reported that they learned from the exhibits or program they attended.



Source: Patron Surveys

Based on the number of survey responses to questions about children, about 64% of the survey respondents had children with them. The majority of caregivers said their children learned something from the exhibit or program they attended.

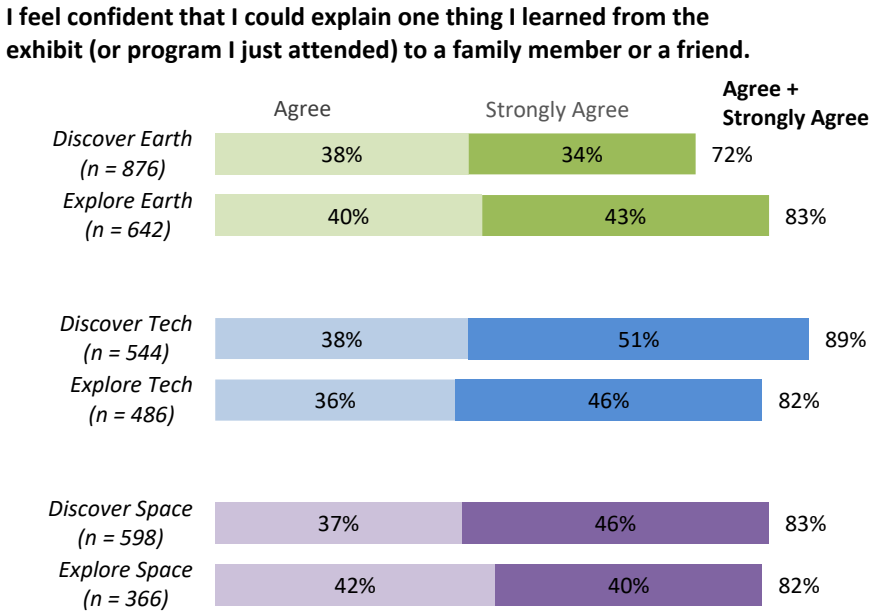
Figure 22. Caregivers reported that their children learned from the exhibits or program they attended.



Source: Patron Surveys

The majority of patrons were confident that they could explain something they learned from the exhibit or *STAR Net* program to someone else.

Figure 23. Patrons reported that would be able to explain what they learned to someone else.



Source: Patron Surveys

In interviews conducted as a part of site visits to *STAR Net* libraries, library patrons were asked what they had learned from the exhibit. Most patrons (65%) were able to recall at least one or two topics and ideas presented in the exhibit about earth science, engineering, or space. Below are several examples of what children and adults said they learned.

Table 18. Library patrons were able to recall topics and ideas presented in the *STAR Net* exhibit or program.

Exhibit Topic	Examples of What Patrons Learned
discover SPACE explore SPACE	• It taught me about ion fields and magnetic forces. • I learned that it's not an easy job to land on planets. • I learned there is a moon that has acid rain and water. The exhibit is good high school science. • I didn't know that sun flares were bad. • I didn't know that there was a special telescope just to look at the sun. • I learned that you use binoculars to see stuff at night and that telescopes don't have to be too expensive.
discover TECH explore TECH	• My daughter has learned about Snap Circuits. Her first time was not so good—she couldn't make it work, but then she came back and learned to read the cards. Then she was successful. She does it every time we come. • I learned about what engineers do. • I didn't know about the Grand Challenges [for Engineering].
discover EARTH explore EARTH	• I knew there was an underwater ridge but I didn't know about underwater mountains. • I learned about the difference between climate and weather. I sort of knew that already, but now I really know. My children have really learned a lot. This was very educational. • Who knew Miami would be underwater?!

Source: Patron Interviews

✓ **Indicator:** Library patrons increase their interest in the library as a STEM learning place:
- indicate that the library is one place to learn science
- indicate a greater demand for STEM programs at the library after the exhibit

During interviews with patrons, patrons were informed that having a travelling exhibit like *STAR Net* at libraries was a new idea, and then they were asked what they thought of having exhibits like these at libraries. All of the patrons who were asked this question responded positively and were supportive of libraries hosting STEM exhibits. Several patrons said the exhibits were especially valuable for their children or their grandchildren. Patrons' comments included:

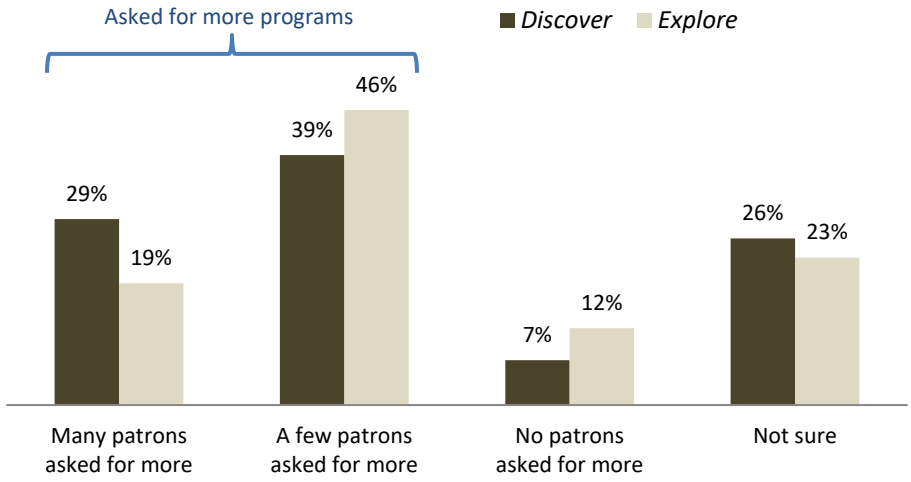
- "This is a great idea! It ties into the library theme and with their resources, books, and other materials—a very good idea. It is a good fit for our library."

- "I think all libraries should have things like this. When is the next one coming? Seriously, this is great, especially for the summer reading program. We will be in regularly and that will give us time to do more exploring."
- "I will be posting this [on social media] because it's educational, informative, and a nice cool place."
- "I like it. It makes the library more interesting and fun to visit. We will be disappointed when it leaves."
- "This is wonderful. It is so good for kids to see this type of thing. It shows them that science is fun! This is really good for our children. They need to see that science and technology is useful.
- "It is a good idea. Libraries are so different now—much better than when I was a kid."

The majority of library staff who were interviewed shortly after the exhibit left their library and/or completed a survey six months after the exhibit left their library said they thought the exhibit had a lasting impact on their patrons. Several librarians said that patrons continued to talk or ask about the exhibit, even months after it left their facility.

All librarians completing the Six Month Post-Exhibit Survey were asked if patrons at their libraries had asked for more STEM activities or programs. Two thirds of the respondents (66%) said that patrons had asked for more activities or programs: 23% of library staff reported that "Many" patrons had asked for STEM activities or programs and 43% of library staff reported that "A few" patrons had asked for STEM programming. A quarter of the respondents indicated they were "Not sure" (24%). Ten percent of the library staff reported that "No patrons" had requested more STEM activities or programs.

Figure 24. The majority of library staff reported that patrons have asked more science, technology or engineering activities or programs in the six months since the exhibit left their library.



Source: Library Staff Six Month Post-Exhibit Surveys; n = 57 *Explore* respondents and n = 31 *Discover* respondents

Librarians described a number of examples of patrons requesting more STEM programming:

- "Patrons are looking to us now to do big things! This is great. It's also a challenge! They expect us to present top-notch material and programming since *Discover Space*. We are in competition with ourselves!"

- "Library patrons came to expect more STEM programs and more STEM exhibits at the library. Library patrons have been asking for another such exhibit, they were completely in love with the *Discover Space* exhibit!"
- "There is an interest in by our patrons, mainly our youth, in having more STEM and hands-on learning experiences."
- "The exhibit has impacted the community in positive way. We have seen an increase in customer participation and attendance in other library programs. In fact, customers have expressed interest in other STEM activities including planetary and star searches."
- "With the addition of these exhibits, we've started having recurring STEM programs for children in grades K-5. We think it was, in part, due to this exhibit. Our library patrons are looking forward to new exhibits and STEM programs we can provide."
- "After the *Explore Space* exhibit left, the patrons seemed to have an expectation that we would always have extra experiential offering at the branch. We have had to provide more pop up activities."
- "We have had several requests for more programming around the natural world and habitat."
- "A number of patrons commented that they enjoyed the educational and fun programming that we developed. We have also been asked about doing an event for the eclipse this year, which we are in the midst of planning for."
- "We have had lots of patrons ask for more STEM activities. We have been incorporating STEM ideas into many aspects of our programming since *Explore Tech*, at patron request. We have incorporated STEM topics in our story times and we have incorporated more STEM topics in our afterschool programming. The exhibit introduced our patrons to concepts and materials that they weren't necessarily familiar with. Since *Explore Tech*, we have had requests for more Snap Circuit and more Cubelets programming. Because of the desire for more STEM programming, we have made STEM kits that patrons can check out and use at home; these have been a big success."

Question 5: Are there differences in librarian and patron outcomes at libraries that receive the small *Explore* exhibits versus the large *Discover* exhibits?

Libraries and Library Staff

As a group, *Explore* libraries were less likely than *Discover* libraries to have certain kinds of STEM resources in their communities, or to have prior experience or training in facilitating STEM programs. In spite of this lack of experience, *Discover* and *Explore* library staff had similar increases in their knowledge, confidence and interest in STEM programming after participating in *STAR Net*. Furthermore, *Explore* libraries implemented more STEM programs than *Discover* libraries (adjusting for the shorter time period that *Explore* libraries hosted the exhibit). However, *Discover* libraries implemented more STEM programs in the six months after the exhibit left their libraries than *Explore* libraries.

The following three tables outline the ways in which the *Discover* and *Explore* libraries and library staff were similar and different in terms of their past experience with STEM (Table 19); *STAR Net*'s impact on their knowledge, confidence and interest in STEM programming (Table 20); and their implementation of STEM programming during and after the exhibit (Table 21).

Table 19. As a group, *Explore* libraries had fewer STEM resources and were less experienced with STEM programming prior to *STAR Net*.

	***Discover* and *Explore* libraries and library staff were similar**	***Discover* and *Explore* libraries and library staff were different**
Community characteristics 	• *Discover* and *Explore* libraries that had collaborated with a STEM organization prior to *STAR Net* had partnered with different types of STEM organizations at similar rates, including science centers, zoos, and higher education institutions.	• *Explore* libraries were somewhat more likely to be located in a rural community: 45% of *Explore* libraries and 37% of *Discover* libraries reported they were in either a rural or rural/suburban community. • *Discover* communities were more likely to have a college and/or university in their community (88%) than *Explore* libraries (64%). • *Explore* libraries were less likely to have partnered with a STEM organization prior to *STAR Net*. While 23% of *Explore* libraries had never collaborated with a STEM organization, only 8% of *Discover* libraries had never done so.
STEM experience prior to *STAR Net*	• Individual staff from libraries hosting *Explore* exhibits and *Discover* exhibits had implemented STEM programs at similar rates prior to *STAR Net*.	• *Explore* libraries had more experience with STEM programming prior to *STAR Net*. The average *Discover* library and the average *Explore* library had offered roughly the same number of programs

	Discover and *Explore* libraries and library staff were similar	*Discover* and *Explore* libraries and library staff were different
		on any topic in the year prior to *STAR Net*. However, *Discover* libraries had offered nearly three times as many STEM programs (100) as *Explore* libraries (36). • *Explore* libraries were more likely to rely on outside partners and volunteers to develop and to implement STEM programming. While 67% of *Discover* libraries used outside partners to conduct at least some of their STEM programming, 85% of *Explore* libraries used outside partners. • *Discover* librarians (53%) were more likely to have previously received training on implementing STEM programming than *Explore* librarians (35%).

Source: ALA Final Report Form; Library Staff Pre-Exhibit Survey

Table 20. Although *Explore* and *Discover* library staff received different professional development, they felt equally prepared to host the exhibits and facilitate exhibit-related programming, and showed very similar gains in their knowledge, confidence, and interest in facilitating STEM programming.

	Discover and *Explore* library staff were similar	*Discover* and *Explore* library staff were different
Professional development 	• *Discover* and *Explore* library staff rated the PD they received to prepare them to host the exhibits and offer programming very similarly.	N/A
Knowledge, confidence, and interest in STEM programming 	• *Discover* and *Explore* library staff had very similar increases in their knowledge, confidence and interest in STEM programming following participation in *STAR Net*. *Discover* and *Explore Earth* librarians' knowledge and confidence in facilitating STEM programming grew at similar rates, as did *Discover* and *Explore Tech* librarians' and *Discover* and *Explore Space* librarians'.	N/A

Source: Matched Library Staff Pre-Exhibit and Six Month Post-Exhibit Surveys

Table 21. *Discover* and *Explore* libraries implementation experiences were similar in some respects and different in others. *Discover* and *Explore* library staff gave *STAR Net* similar ratings. While the typical *Explore* library hosted more programs per month while they hosted the exhibit than the typical *Discover* library, *Discover* libraries hosted more programs than *Explore* libraries in the six months after the exhibit had left.

	***Discover* and *Explore* libraries and library staff were similar**	***Discover* and *Explore* libraries and library staff were different**
Overall rating of *STAR Net* 	• *Discover* and *Explore* library staff were equally likely to indicate that the *STAR Net* exhibit had been a success at their library.	N/A
Use of *STAR Net* resources 	N/A	• *Discover* library staff used the *STAR Net* online CoP more frequently: 60% of *Discover* librarians reported using the CoP at least every other month vs. 42% of *Explore* librarians. • *Discover* library staff were somewhat more likely to use the Teacher Guide (56%) than *Explore* libraries (37%), and slightly more likely to use the Parent Guide (33% of *Discover* vs. 26% of *Explore* library staff).
Number of exhibit-related programs implemented while hosting *STAR Net* exhibit 	N/A	• Libraries hosting the *Explore* exhibits (which had the exhibits for two months each) hosted more programs per month than the *Discover* exhibits (which had the exhibits for three months each). The typical *Explore* library offered seven exhibit-related programs/month, while the typical *Discover* library offered five/month.
Number of STEM programs implemented in the six months after the exhibit left the library 	• *Discover* and *Explore* libraries were equally likely to continue to offer STEM programming in the six months after the exhibit had left their libraries.	• On average, *Discover* libraries offered twice as many STEM-related programs (median of 25 programs) in the six months after the exhibit left their libraries as *Explore* libraries (median of 11 programs).

Source: ALA Final Report Form; Library Staff Six Month Post-Exhibit Surveys

Library Patrons

Library patrons from *Explore* and *Discover* libraries appeared to have similar positive outcomes, based on results from the Patron Survey and interest in additional STEM programming.[11] The table below outlines the ways in which the patron outcomes were similar and different at the *Discover* and *Explore* libraries.

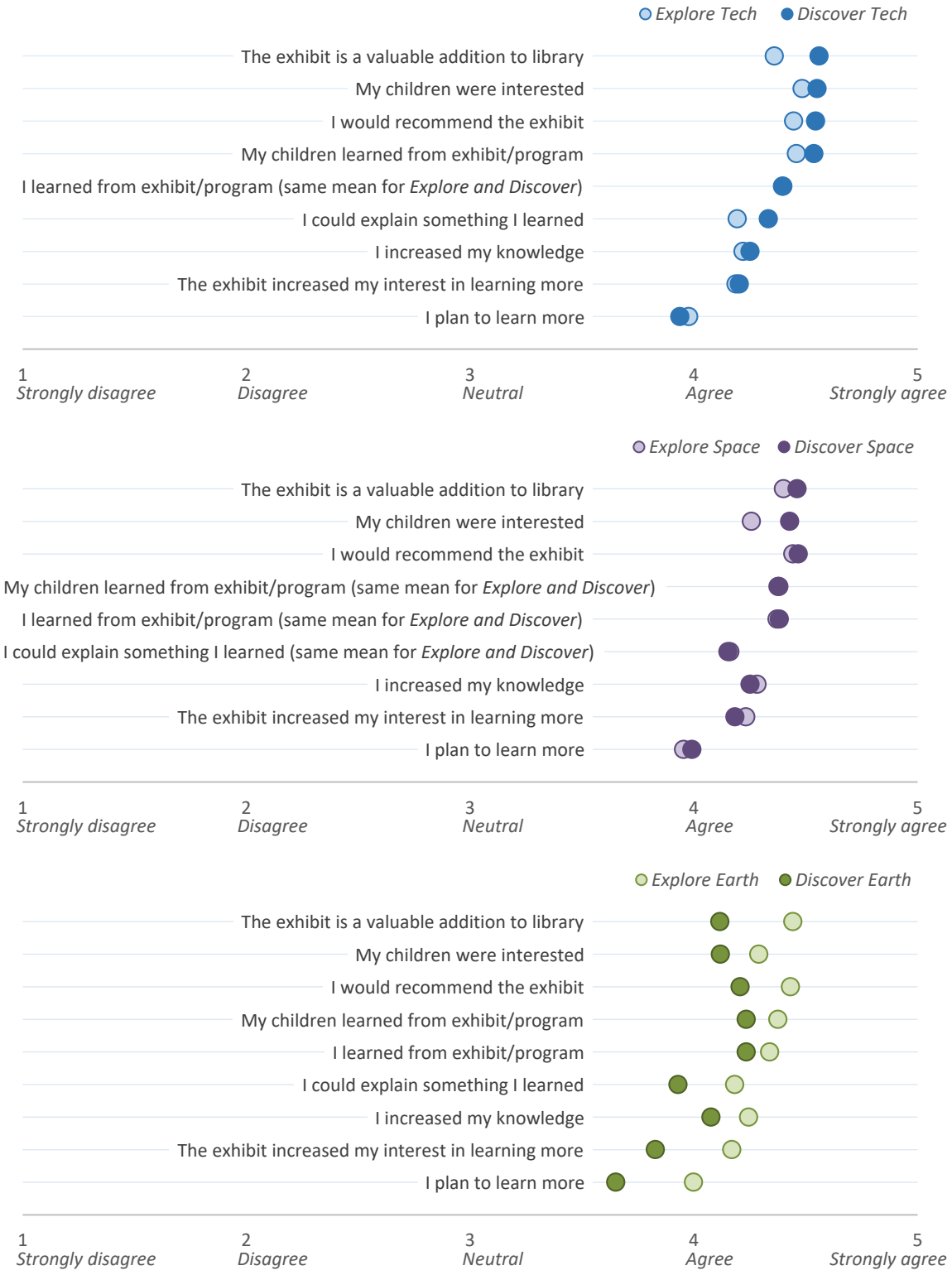
Table 22. Library patrons spent less time looking at the *Explore* exhibits than they did looking at *Discover* exhibits, but reported similar outcomes on the Patron Survey and were equally likely to ask for more STEM programs.

	Patrons at *Discover* and *Explore* libraries were similar	**Patrons at *Discover* and *Explore* libraries were different**
Patron engagement with exhibits 	N/A	• Patrons were more likely to spend time with the *Discover* exhibits than the *Explore* exhibits, and when they did, patrons spent about twice as much time looking at the *Discover* exhibits than they did looking at the *Explore* exhibits. Given that the *Discover* exhibits had more interactive components than the *Explore* exhibits, this result is not surprising (see sidebar on page 69).
Patron satisfaction with exhibits/ programming, knowledge acquisition, and plans to learn more 	*Discover* and *Explore* library patrons' survey responses were very similar regarding their satisfaction with the exhibits and programming, increases in knowledge, and intentions to learn more about the exhibit topic (see Figure 25 on the following page).	N/A
Patron interest in STEM 	• 83% of the *Discover* libraries and 75% of the *Explore* libraries that provided records reported increases in the number of exhibit-related materials that circulated while the exhibits were at their libraries. • Two-thirds of both the *Explore* and the *Discover* library staff reported that patrons asked for more STEM programs in the six months since the exhibit left their library.	• The average *Discover* library circulated 55% more materials related to the exhibit they were hosting, and the average *Explore* library circulated 13% more materials while the exhibit was at their library.

Source: Patron Surveys; Patron observations on site visits; Circulation records; Library Staff Six Month Post-Exhibit Surveys

[11] As noted earlier, caution must be exercised in interpreting the Patron Survey results because only a small percentage of patrons who viewed the exhibit or attended exhibit-related programs completed surveys. A total of 3,541 Patron Surveys were received from an estimated 1.1 million visitors. Patrons who completed the surveys may not be representative of the majority of visitors.

Figure 25. With the exception of the *Earth* exhibits, patrons generally rated the *Explore* and *Discover* exhibits very similarly and reported similar impacts to their knowledge and interest in the exhibit topic. (Questions are shown in the same order on each of the three figures to facilitate comparison.)



Source: Patron Surveys (*Discover Tech* n = 554; *Explore Tech* n = 492; *Discover Space* n = 613; *Explore Space* n = 376; *Discover Earth* n = 893; *Explore Earth* n = 653)

What did library staff and patrons think of the stand-alone panels?

The written panels comprised the majority of the *Explore* exhibit. Although fewer patrons were observed to read the exhibit panels than to engage with interactive components (the computer kiosks or Discovery Table) during site visits, some patrons said the information was valuable:

- "It's very interesting. It took us a while to go through all the panels. We did it a little bit at a time."
- "It's kind of a lot of reading, but I don't mind. It is kind of interesting."

One *Explore Space* librarian said the written information was an important part of the exhibit, especially for adults:

> "I think it's a great integration of methods of getting information across. I know the panels are not as well viewed or used as the interacting kiosk, but I think it does add a whole other dimension to thinking about space. And I have seen people really stop and read them. Of course, some people walk through and have places to go. I like the size of them. As far as display panels go, even in museums, they are not as well-viewed. The size is great. The images are dynamic. They are visually arresting. But by far the computer kiosk is the most popular. It's fun. I've heard from kids and teens and adults that it's super easy to use—they won't stop."

Other library staff from libraries hosting *Explore* exhibits said the panels may have drawn some patrons at first, but then were ignored:

- "People don't want to look at stuff anymore, they want to do stuff. I love the big displays but I don't think they get as much attention as we wish they would."
- "People will come and look at the panels, but not enough to keep them [engaged]. The computer keeps them 30-45 minutes to even an hour one time. We get teens and adults that keep coming back. Something that's interactive goes better with patron[s] nowadays."
- "When I saw what came in [*Explore*] exhibit itself, it was like, 'Oh.' It wasn't, 'Wow!' It was, 'Oh, that's nice.'…Although the panels are really interesting, I would rather have had one more of something interactive."
- "If there were a way to make the exhibition even more interactive, that would be ideal. The interactive components, both the computer kiosk games and the box of tech gadgets, were more popular than the exhibit panels. Although we tried to get visitors to complete the portion of the exhibit with the Post-it notes, almost no one did this part. We think the hands on learning and the programming surrounding the exhibit are the most successful aspects."

Question 6: What, if any, are the unanticipated consequences of *STAR Net* (positive or negative) on librarians, libraries, patrons, and others?

The *STAR Net* team specified the outcomes they expected and hoped the project would achieve. However, projects often have additional benefits and costs that project planners may not (and often could not) have anticipated. This section of the report describes two additional aspects of the project that did not fit under the pre-specified evaluation questions or indicators.

***STAR Net* helped libraries showcase their role as ever-evolving centers of learning for their communities.**

Several library staff said being a *STAR Net* library, hosting an exhibit, and offering STEM programming helped increase their visibility in the community. Their involvement allowed libraries to promote their role not only as STEM educators, but also as part of their communities' learning ecosystem. One librarian said, "I think it's broadening people's understanding of what libraries do now and how much more engaged we are with educating our community and being an integrated part of educating our community." Another librarian said:

> "The exhibit brought in many people who had never come to the library before, including people of influence in the community. The timing was perfect for funders, as the exhibit was [shortly before when] the county's fiscal year starts. I feel it was responsible for an increase in funding for the library. That said, the biggest success was the shift in the public's eye. It enabled them to see us as more than books and as a resource for hands-on learning. It was a continuation of programs already in place."

STAR Net gave libraries an opportunity to showcase their role as centers for STEM learning. One librarian said, "Our library's mission is to 'connect the community, enrich the mind, and inspire the imagination.' STEM learning helps us meet this mission, and shows our community that the library of the 21st Century is more than books."

A number of libraries experienced equipment challenges, including malfunctioning computer kiosks and missing or broken equipment.

One of the exhibits' unique strengths—museum-quality STEM materials that travel from one library to another all over the country—also proved to be a challenge. Most of the exhibit components were cleverly designed to function as both display cases and shipping crates to minimize the need for libraries to have to store packing crates while hosting the exhibit. Still, a number of libraries reported that one or more of the exhibit components was not working or missing when they received it—perhaps because of normal wear and tear, packing oversights by the previous host library, design flaws, or damage during shipping.

One librarian explained:

> "When [an exhibit] is changing hands so much, you get a lot of problems of things not working.…There needs to be more tender loving care in between library visits. The fact that so many hands are touching it, something is bound to go wrong. It's just the technical aspect that was the problem. The presentation of it was wonderful. The signs were great. It was colorful. It was inviting to people. People were encouraged to participate. They felt it was an inviting exhibit. It was a great way to explore science—better than opening a book."

The evaluation team did not track equipment issues, so the number of sites that experienced technical challenges is not known.[12] However, seven of the 12 libraries that the evaluation team visited experienced equipment problems, including touch table monitors not functioning properly, missing components, or broken equipment (e.g., the Magic Earth Globe not functioning, the tub for the *Discover Earth* Dinosaur Dig being cracked). A few other libraries mentioned on the Six Month Follow-up Survey that they also had experienced equipment challenges.

Libraries reported that sometimes simply restarting the kiosks fixed the problem, but other cases required more advanced IT expertise. Several libraries were fortunate to have a staff member with enough IT or technical know-how to get the equipment functioning, but library staff did not always have the expertise—or the time—to resolve every problem.

The *STAR Net* project team was responsive, and followed up with libraries, sending replacement equipment as needed and providing IT support to address issues with computer kiosks. In one extreme case, a host library decided to send the exhibit to a smaller branch library for the last few weeks they had the exhibit, and staff at this branch did not know how to pack up the exhibit appropriately for shipping. When the exhibit arrived at the next library, several components were broken or missing. A team member from NCIL visited this second library to determine what components needed to be repaired or replaced before the exhibit travelled to the next library, and decided to send some components back to the exhibit manufacturer for refurbishing.

When exhibit components were not working, it was frustrating for both library staff and library visitors. As one librarian put it, "it's not as cool of an exhibit" when the exhibit is not working as designed.

Areas of Consideration

The following recommendations were offered by library staff or emerged based on findings from the summative evaluation.

Suggestions Regarding Professional Development and Support:

- A number of library staff requested more detailed written instructions—including visuals—regarding how to set up each of the exhibit components. As one librarian put it, "Librarians and library staff wear many hats and are smart people, but because of the many hats, it is really helpful to have thorough instructions for something unfamiliar like a large exhibit installation."

[12] The project team may have additional information about equipment issues. Libraries were required to submit a Condition Report to ALA shortly after receiving an exhibit from the previous host library.

Library staff from *Discover* libraries that hosted the exhibit long after they had attended the in-person workshop and *Explore* library staff (who did not have an in-person training) especially said it would be helpful to have additional information about exhibit set-up. Library staff suggested creating videos of the exhibit set-up and take-down processes for each exhibit, developing a more detailed set-up guide that includes information about how to set up the kiosks, and including a diagram and/or photos about how to pack the shipping crates. A frequently asked question section might also be helpful (answering such questions as, 'Should the kiosks be powered down each evening before the library closes?').

Suggestions Regarding the Exhibits:

- As noted earlier, some elements of the exhibits suffered during the extended tour, and needed additional monitoring for maintenance and upkeep. If the project team continues to circulate the computer kiosks, the hardware and software may need to be updated to be more robust. One library suggested, "Perhaps in future exhibits, you could do two sets of four exhibit locations, instead of one set of eight locations. This means the exhibit could receive a 'wear and tear refresh,' and the last site location won't have almost three years between the initial excitement of applying for and winning the grant, and the actual work of doing the grant."
- Four libraries requested that exhibit materials be made available in Spanish. As one librarian put it, "many communities…have a fair number of patrons who speak Spanish only."
- Several libraries requested more hands-on materials be included (e.g., a space suit or space helmet, a piece of heat shield from a shuttle).
- While several librarians were observed to help visitors interact with the kiosks, other library staff were less comfortable doing so. One library staff member suggested creating facilitation guides for library staff and library volunteers about how they can help visitors to interact with the kiosks.
- Multiple library staff requested templates that they could use to promote the exhibit and associated programs. As one library staff member put it, "Our number one suggestion would be to provide host libraries with handy publicity materials—at minimum a brochure, a flyer, and a poster, containing all necessary logos, all customizable so that the library can easily add its own name, etc. Such ready-made materials would be a great boon to rural and small-town libraries that lack in-house designers."

Suggestions Regarding the Community of Practice

- Some library staff struggled to find exhibit-specific information in iMeet, especially for the *Explore* exhibits. One librarian said, "The iMeet workspace wasn't as easy to navigate as we hoped. We did use information from the site, but with all the other *Explore* exhibits listed there (and the *Discover* exhibits), the site could be overwhelming for finding information. A listserv might also have been helpful for communication among this specific exhibit's grantees."

- Library staff suggested facilitating more cross-library communication regarding exhibit set up and programming. A librarian suggested, "Allow more communication and collaboration between the libraries who received this exhibition. I would have loved to have learned how the libraries before me ran their exhibitions and what programs worked or did not work for them. I also would love to have shared what I learned with other libraries." A few libraries said they reached out to the previous host libraries to get tips and ideas, including one library that was able to visit a previous host library. Libraries may need more of a "push" from the project team to encourage them to communicate directly with other host libraries, as well as supports that make it easier for them to do so. For example, one librarian suggested sending previous libraries' completed ALA Reports for inspiration, while another librarian suggested sharing photos.

Conclusion

In conclusion, the majority of participating librarians and library patrons were very positive about *STAR Net* Phase 2. One librarian said, "This has been one of the easiest and most important projects that our library has been involved in for the nine years I've been the director."

Library staff reported that the resources the project provided were helpful, and that they increased their knowledge, interest, and confidence in offering STEM programming in their libraries. Many libraries developed new connections or deepened existing connections with organizations they had worked with previously in order to provide STEM programming in their libraries.

The project reached audiences with hands-on inquiry-base exhibits and programming that patrons in many of the *STAR Net* communities would otherwise have not had access to. The exhibits appeared to spark the interest of many patrons to learn more about science and technology. The majority of libraries had continued to offer STEM programming in the six months after the exhibit had left their libraries, and reported that they planned to continue to do so.

Given the differences in prior STEM experience between the *Discover* and *Explore* libraries—as well as the difference in *STAR Net*'s investment in PD and exhibit development—it is particularly noteworthy that outcomes for library staff and patrons at *Explore* libraries were roughly equivalent to those at *Discover* libraries.