Executive Summary of the

STAR Net Phase 2 Summative Evaluation Report

Science-Technology Activities & Resources For Libraries

PREPARED FOR

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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 a virtual community of practice for library staff and others interested in bringing STEM programming to libraries. In 2014, the National Science Foundation (NSF) awarded a four-year grant to the Space Science Institute's (SSI) National Center for Interactive Learning (NCIL) and its partners—the American Library Association (ALA), the Lunar and Planetary Institute (LPI), the Afterschool Alliance (AA), and Datum—to develop a hands-on learning program for 66 public libraries and their communities.

Education Development Center (EDC) conducted the summative evaluation of *STAR Net* Phase 2, investigating the implementation of the project and its impact on library staff and patrons. Methods included pre- and post-exhibit surveys administered to staff from each library that hosted the exhibits; patron surveys; exhibit-related circulation records; and site visits to 12 libraries hosting a *STAR Net Discover* or *Explore* exhibit, during which patrons and library staff were observed and interviewed.

Key findings regarding *STAR Net*'s Phase 2 implementation and impact are described below.

> ### *STAR Net*'s professional development helped librarians host the exhibits and deliver high quality informal science education programming.

- Prior to participating in *STAR Net* Phase 2, the majority of library staff (60%) had not received professional development focused on implementing STEM programs for library patrons. Most participating librarians said *STAR Net*'s initial in-person training (for library staff hosting one of the three larger *Discover* exhibits) or kick-off webinar (for library staff hosting one of the three smaller *Explore* exhibits) prepared them to host the exhibit, and that the follow-up webinars about informal science activities helped them deliver exhibit-related 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, many library staff indicated they became even more interested and committed to developing and facilitating STEM-based programming. Some 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.

- Librarians increased their knowledge about earth science, engineering, or space science as a result of their participation in *STAR Net*. The pre-/post-surveys asked librarians to rate their knowledge about several exhibit-related topics; librarians were asked a set of questions about engineering, space, or earth sciences, depending on which exhibit they were hosting. On average, librarians hosting either *Discover Tech* or *Explore Tech* increased their knowledge more than one point on a five-point scale from 1 = Beginner to 5 = Expert, to an average of 3.3 after they had hosted the exhibit. *Discover Earth* and *Explore Earth* librarians increased their knowledge 0.7 points (to an average of 3.3 after they had hosted the exhibit), while *Discover Space* and *Explore Space* librarians increased their knowledge 0.8

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

(to an average of 2.8 six months after they hosted the exhibit). In interviews, several library staff said the *STAR Net* training and resources had increased their knowledge of earth science, space, or engineering topics.

- Many *Discover* and *Explore* library staff became more confident in their abilities to deliver informal science programs effectively. On average, *Earth* and *Tech* library staff reported their confidence increased from medium before *STAR Net* to high after *STAR Net*, while *Space* library staff reported that their confidence increased from low/medium before *STAR Net* to medium/high after *STAR Net*.

- The 60 libraries that hosted *STAR Net* exhibits through July 2018 facilitated a combined total of 860 programs (an average of 14 exhibit-related programs per library). The most popular program format was hands-on investigation, which was featured in half (50%) of all the required programs. Host libraries were required to conduct a minimum of 10 programs.

- Library staff said the *STAR Net* training and resources made it easier for them to offer STEM programming. The vast majority of libraries used *STAR Net* resources for at least one program while hosting the exhibit, and 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 majority of libraries (85%) organized, hosted, or promoted additional STEM programs in the six months since the exhibit had left their libraries, and almost all of the libraries (91%) planned to offer STEM programs at their libraries in the future. Most libraries (70%) had acquired additional STEM resources.

- 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%). Library staff said public libraries are uniquely positioned to promote STEM because they are broadly accessible institutions, reach individuals who are underrepresented in STEM, and can make STEM learning fun.

Phase 2 public library staff formed partnerships with STEM professionals and educators to provide STEM programming for youth and adults.

- The majority of libraries 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. Many libraries said that they expected the partnerships they had established to continue in the future.

- The majority of the programs that libraries presented while they hosted *STAR Net* exhibits were facilitated by external partners. Library staff facilitated 42% of the required programs by themselves, while 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).

- Host libraries continued to collaborate with external partners to implement STEM-based programming after the *STAR Net* exhibits left their libraries. Of libraries that continued to implement STEM programs, 64% of libraries had STEM programs that were facilitated by external partners.

> **STAR Net largely succeeded in reaching the targeted library participants and audiences at the host libraries, reaching groups who are historically underrepresented in STEM.**

- The libraries that hosted the exhibits reported that they had success in reaching their communities, often attracting new visitors to their libraries. Library staff estimated that more than 1.1 million visitors had seen a *STAR Net* Phase 2 exhibit through July 2018, and almost 50,000 adults and children had attended exhibit-related programs. 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.

- Although most of the host library communities had access to at least some STEM resources (such as higher education institutions), 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.

- The vast majority of *STAR Net* Phase 2 libraries (93%) were successful in reaching at least one audience historically underrepresented in STEM fields, including rural communities, lower-income populations, individuals from racial and ethnic groups that are underrepresented in STEM (especially Hispanics), girls, recent immigrants, and individuals with special needs.

- Although almost all the libraries reported that they were successful in reaching at least one underrepresented audience, about 20% of the libraries said they were less successful than they had hoped. Libraries cited different reasons for having lower turnout than hoped, including not having enough time to conduct targeted outreach and challenges coordinating with external partners.

- 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." 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.

- 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).

> **Many library patrons at the host libraries became more interested in, knowledgeable about, 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. Patrons especially valued the hands-on nature of the exhibits. Most patrons 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 majority of patrons who responded to the Patron Survey said that the exhibit increased their awareness of earth science, engineering, or space science and increased their interest in learning more about these topics.

- About two thirds of the patrons said they intended to use library resources to learn more about science. Many library staff indicated that they promoted exhibit-related materials to patrons, such as through temporary displays of books or DVDs located near the exhibits. Although there was considerable variation by library, the average *Discover* library circulated 55% more exhibit-related materials while the exhibit was at their library, and the average *Explore* library circulated 13% more materials.

- Patrons said that the exhibits increased their knowledge of earth science, engineering, 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. In interviews conducted as a part of site visits to *STAR Net* libraries, 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.

- All patrons who were interviewed during site visits said they were supportive of libraries hosting STEM exhibits. Several librarians said that patrons continued to talk or ask about the exhibit, even months after it left their facility. About two-thirds of the librarians (66%) who completed the Six Month Post-Exhibit Survey said that patrons had asked for more activities or programs. Many librarians also remarked they believe that patrons now see the library as more than just a repository for books.

> **There were relatively few differences in librarian or patron outcomes at libraries that receive the small *Explore* exhibits versus the large *Discover* exhibits.**

- *Explore* libraries and library staff were less likely than *Discover* libraries to have 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*.

- *Explore* libraries implemented more STEM programs than *Discover* libraries (adjusting for the shorter time period that *Explore* libraries hosted the exhibit). The typical *Explore* library offered seven exhibit-related programs per month, while the typical *Discover* library offered five programs per month.

- However, *Discover* libraries implemented more STEM programs in the six months after the exhibit left their libraries than *Explore* libraries. On average, *Discover* libraries offered twice as many STEM-related programs (a median of 25 programs) in the six months after the exhibit left their libraries as *Explore* libraries (a median of 11 programs).

- 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. 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.

Conclusion

In summary, 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 informal science 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/engineering. 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* 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.

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