



## **INSIDE: WASHED ASHORE AT THE DENVER ZOO**

PLUS: COMMUNITY COLLABORATIONS, LEARNING IN A SKATEPARK,  
STEM LEARNING IN PUBLIC LIBRARIES, AND MORE

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## STEM LEARNING IN PUBLIC LIBRARIES: NEW PERSPECTIVES ON COLLABORATION FROM A NATIONAL CONFERENCE

*By Keliann LaConte and Paul Dusenbery*

### PUBLIC LIBRARIES AND STEM

The informal STEM education (ISE) field is a landscape that includes a variety of institutions beyond schools, including museums, science centers, zoos, youth and adult organizations, documentary film producers—and public libraries (J. H. Falk, Randol, and Dierking 2012). Libraries across the country have been reimagining their community role and leveraging their resources and public trust to strengthen community-based learning and foster critical thinking, problem solving, and engagement in STEM.

The national movement of STEM learning in libraries is gaining momentum: Many libraries are now providing innovative STEM activities in their youth programs, including interactive exhibitions and hands-on workshops. More and more libraries are responding to the need to increase science literacy and support 21st century skills by adding to STEM programs for patrons of all ages, from pre-school to adults (IMLS 2009). From Portland, Oregon, to Portland, Maine, libraries are hosting Science Saturdays, Robot

Races, Maker Spaces, and STEM exhibitions. Building on a long tradition of library-led summer educational programs and reflecting the increased infusion of STEM, the National Collaborative Summer Library Program™ slogan for 2017 is "Build a Better World" and for 2019, the theme will be "Space."



*Figure 1: The 2015 Public Libraries & STEM conference was the first of its kind for bringing professionals from the library and STEM professions together. Here, participants engaged in hands-on teamwork with Keva planks.*

Clearly, public libraries are an active part of the informal STEM education landscape; how can other ISE sectors intersect with them effectively?

### CROSS-SECTOR STEM COLLABORATIONS

Libraries have a deep history of knowledge and learning, reaching four millennia into our past. They evolved toward a strong focus on materials that could be circulated, with the community accessing the library to consume media and services. Indeed, public library resources and services are highly valued and frequented by groups underrepresented in STEM—and thus prioritized by federal and non-federal funders—including women, lower-income individuals, African Americans, and Hispanics (Zickuhr et al. 2013). Now, library staff are shifting their focus from *informing* their communities to *empowering* community members. David Lankes, Director of the University of South Carolina’s School of Library and Information Science, advocates for librarians to “facilitate the use and sharing of STEM expertise already existent in the community by the community” and shift their perspective to include their communities as part of their collections, beyond just circulation materials (Lankes 2015).

The public library can serve as the community-based anchor organization nurturing cross-sector STEM collaborations (Semmel 2015), placed within a *STEM learning ecosystem* (Falk 2015). A STEM Learning Ecosystem involves preK-12 schools and programs, community-based organizations, out-of-school-time (OST) providers, innovative family programs, and higher education institutions such as community colleges, trade schools, and universities—all working together to create sustainable and lasting change through cross-sector collaborations (Traphagen and Traill 2014). The National Academies of Science (National Research Council 2014) challenges educational institutions to “mesh (partner) contributions synergistically rather than duplicatively while adapting models that have worked well in one place to the culture, governance, and idiosyncrasies in other settings.” Libraries can respond to—and create partnerships that enable—specific and local learning needs (National Research Council 2015), all toward a *Collective Impact* (Kania and Kramer 2011). There is no “playbook” for creating such an integrated system (Semmel 2015), but as trusted community institutions, public libraries have the local credibility to take this on for their communities. Libraries serve as “boundary spanning organizations” (Rich Harwood), community hubs, and focal points for 21st century learning (“Leadership Brief: Libraries Igniting Learning” 2014).

Recently, the American Library Association, in partnership with the Harwood Institute for Public Innovation, launched the *Libraries Transforming Communities* initiative (The

Harwood Institute for Public Innovation 2015), which has developed guides, tools, and professional development opportunities to “strengthen the role of librarians and libraries as conveners and facilitators of community innovation and change.” The Learning Labs in Libraries and Museums program funded innovative spaces for youth at various informal learning venues and involved over 60 organizations and engaged in all three levels or stages described by collaboration theory—namely, cooperation, coordination, and collaboration—that were appropriate for a given community (Zeigler 2015).

Another recent collective impact approach involving libraries as a key stakeholder is the *Cities of Learning* projects in Chicago, Dallas, Pittsburgh, and other cities. The Chicago model, called *Thrive Chicago* (2014), engaged almost 200 organizations, representing non-profit providers, education systems, college and universities, research and advocacy organizations, museums and cultural institutions, and industry and philanthropic partners—all supporting Chicagoans along the continuum from cradle to career. Beyond the school day, over 100 organizations (including the Chicago Public Library and the Museum of Science and Industry) are participating in Chicago’s *City of Learning*, which is focused on providing summer and OST learning experiences in STEAM for 200,000 students, ages 4 to 24. Similar grass roots projects, at various scales, are being initiated nation-wide (J. H. Falk et al. 2015; National Research Council 2015; Traphagen and Traill 2014).

### TRAVELING EXHIBITS CATALYZE PARTNERSHIPS

Traveling STEM exhibitions are catalyzing these partnerships and engaging students, families, and adults in repeat visits through an accessible venue: their public library. The NSF-funded STAR Library Education Network (*STAR\_Net*) is a hands-on learning program for libraries and their communities across the country, which focuses on building STEM skills through developing “science-technology activities and resources” (STAR). *STAR\_Net* is a leader in the field and supports STEM programming in libraries with traveling exhibits and professional development. The impact of the *STAR\_Net* exhibition *Discover Earth: A Century of Change* on partnerships, the circulation of STEM resources, and the engagement of learners was studied by an external evaluation team. The *STAR\_Net* project’s summative evaluation utilized mixed methods to investigate project implementation and its outcomes. Methods included pre- and post-exhibit surveys administered to staff from each library that hosted the exhibits; interviews with staff from host libraries; patron surveys; exhibit-related circulation records; web metrics regarding the online *STAR\_Net* community of practice; and site visits. A subset of host libraries recruited professionals, who delivered programming that connected Earth systems science, weather, climate, and conservation



Figure 2: The Public Libraries & STEM conference facilitated strategic partnerships between the community of public libraries and STEM education and research organizations.

themes from the exhibit to local issues. Library patrons improved their knowledge about STEM topics presented in the exhibits and associated programming, and patrons viewing the exhibit reflected the demographics of their communities (Fitzhugh, Coulon, and Elworth 2013).

### THE 2015 PUBLIC LIBRARIES & STEM CONFERENCE

Given the opportunities afforded by the parallel rise in STEM and community empowerment in public libraries, the Space Science Institute's National Center for Interactive Learning, in partnership with the Lunar and Planetary Institute and with support from the National Science Foundation, convened the first-ever *Public Libraries & STEM* conference that took place in Denver, Colorado, August 20-22, 2015. The goal of the conference was to facilitate strategic partnerships between the community of public libraries and STEM education and research organizations. Attendees explored promising practices in designing effective STEM programs; helped define a 21st century vision of STEM learning in public libraries; and developed the foundation for a future evaluation and research agenda for libraries and their partners engaged in STEM education efforts. It was also a valuable forum to discuss the needs, challenges, opportunities, and promising practices related to informal STEM learning that is beginning to take root in public libraries. Attendees spent time networking at local points of interest, including the Denver Public Library and the Denver Museum of Nature and Science. A Leadership Forum, consisting of leaders and decision-makers from both the public library and informal STEM education and research communities, has been established to provide ongoing communication.

### CONFERENCE PARTICIPANTS

The conference attracted over 150 participants, including representatives of library organizations (e.g. American Library Association; Association of Rural and Small Libraries); representatives of STEM organizations, including the Association of Science-Technology Centers (ASTC), American Society of Civil Engineers (ASCE), and American Association for the Advancement of Science (AAAS); funders; and many researchers and evaluators.

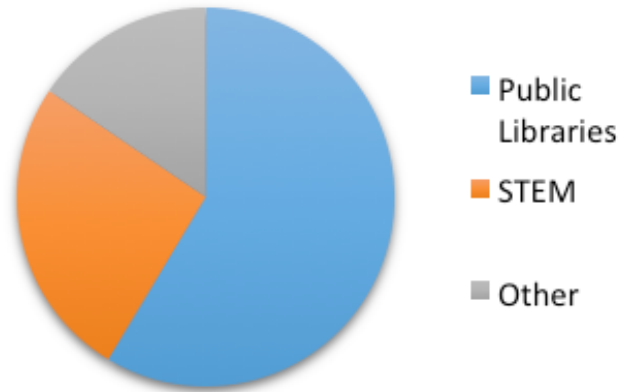


Figure 3: Professions of attendees (MacCarthy 2015).

During the conference, attendees explored best practices in collaboration and shared successes and lessons learned from a variety of past partnerships, including collaborations between library and STEM professionals. Key note presentations and panel discussions provided information that formed the basis of small- and whole-group discussions. Attendees presented posters showcasing successful STEM programs, collaboration, visions for the future, reaching groups underrepresented in STEM fields, and research and evaluation. A community of practice was identified as a key need, and such a community would help libraries and their partners support the ongoing inclusion of STEM learning experiences. The results of a needs assessment survey of libraries were also disseminated at the conference (Hakala et al. 2016).

### CONFERENCE RESOURCES

Leading up to the conference, recent research contributing to the understanding of informal STEM learning in public libraries (on both patrons and librarians) was compiled and



Figure 4: Anita Krishnamurthi, Afterschool Alliance (left) and Ron Solórzano, Ventura County Library (right) discuss how lessons learned from the afterschool sector could inform next steps for STEM learning in libraries at a poster session.





Library of Philadelphia began the LEAP Into Science program in 2007, and it has now grown to provide training and curriculum materials in 10 cities nationwide. While library staff increase their capacity in science, science partners increase their capacity in literacy (West et al. 2015).

### RESULTS

Participant feedback included one comment characterizing the 2015 conference as “one of the most formative and transformative experiences of my career.” Other comments were similarly positive.

The training in existing OST research was also noted in one survey respondent’s list of most important (transformative) outcomes: “Empowerment that what we are doing in Public Libraries truly IS important to the lifelong education of our citizens. That it’s more than something ‘nice to have’ or ‘just for fun.’ It’s given us a whole new perspective knowing that there is research behind the efficacy of programming in informal environments like ours. We now feel empowered to own that position.”

Collaboration and ecosystem perspectives were among the most important takeaways listed in a follow-up survey, and 71% (n=56) have contacted new collaborators in the six weeks following the conference. These results are in contrast to the findings from the 2014 survey described above, which demonstrated that most library programming is facilitated by library staff, instead of with and/or by partners. Participants reported the impact of training on collective impact, ecosystem perspectives, and collaboration examples: “The big takeaway for me was to partner, partner, partner, so I plan to work closely with more community groups and the university, rather than try to come up with original programming all the time,” and “My most important takeaway was thinking about the library as a single entity in a larger learning ecosystem.” Representatives from the STEM professions noted: “As a non-librarian, this



Figure 6: Participant feedback was positive.

### EVALUATION

An external evaluation was conducted to:

1. Identify trends emerging in libraries and STEM organizations that both parties can utilize going forward.
2. Determine whether the conference produced new partnerships and what this collaboration will accomplish.

The evaluation consisted of questionnaires that were provided to the attendees at the conference at the end of each day; a focus group at the close of the conference; and a follow-up survey beginning six weeks after the conference.

## What Aspect was Most Valuable?

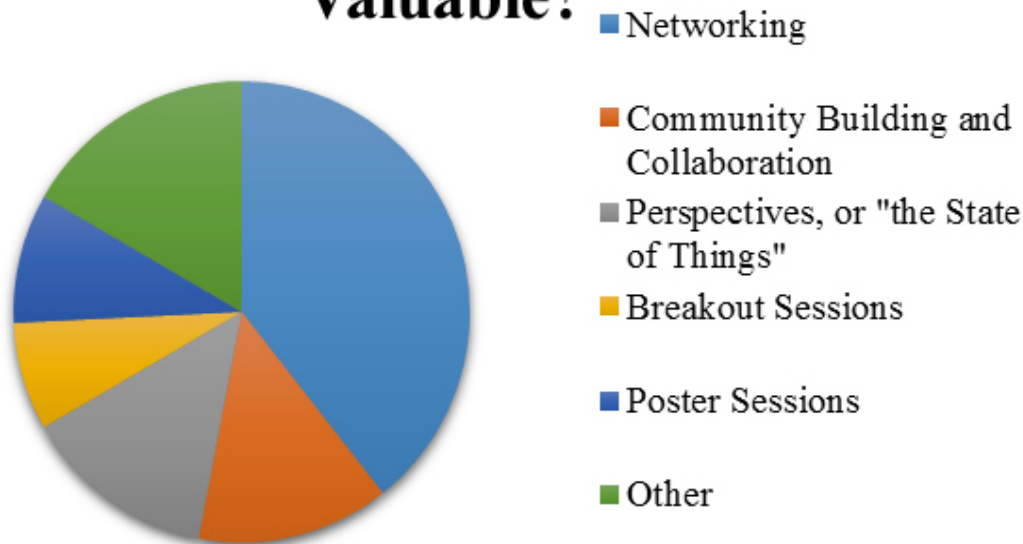


Figure 7: Networking was the most valuable aspect of the conference.

conference has been incredibly eye-opening and inspiring and a great way to get connected to new partners (librarians). I feel energized to do new work supporting these institutions.” Another remarked, “I appreciated knowing where other libraries stood in terms of programming offered, and that STEM professionals were generally willing to collaborate.”

Most survey respondents stated that their primary goal in attending the conference was to network (n=84). One attendee captured the value of the networking that took place – especially through the highly-ranked poster and break-out discussions (n=57): “The conversations were insightful and created a bonding” (MacCarthy 2015).

## CONCLUSION

The conference drew attention to how the fields of informal STEM education (ISE) and librarianship can be advanced through additional intersections across professions. Attendees remarked on the revelations they experienced about how libraries can play a role in STEM education. There was an exchange of resources and ideas across professions, and the individuals formed new relationships. The conference laid the groundwork for thought-leaders, the formation of an ALA-supported *STEM in Libraries* group, and conference conveners to organize relevant resources and facilitate access to those resources by library and STEM professionals.

Moving forward, conference attendees recommended shifting the focus away from how libraries can become like science centers or other informal STEM organizations. Instead, organizations should form reciprocal relationships across sectors, with each contributing unique assets. How can existing informal STEM education organizations support public libraries in their transition from a focus on reading literacy to one that embraces STEM literacy? The authors encourage all ISE practitioners to help make this a reality.

Strategic collaboration is central to overcoming challenges. The *Public Libraries & STEM* conference was just the beginning of conversations to move toward a sharing of resources, perspectives, and practices that leverage our disparate professions.

## JOIN US!

Connect with library professionals through the *STAR\_Net* community of practice at [www.starnetlibraries.org](http://www.starnetlibraries.org). The *STAR\_Net* community website provides library professionals with vetted hands-on STEM activities, training opportunities, and opportunities for community building (forums, wikis, etc.). Informal education professionals are invited to participate in this community toward the shared goal of

conducting high-quality, interactive STEM programming for library patrons. Also, consider submitting your tested activities for review to the *STAR\_Net* Activity Clearinghouse, or volunteer to host a webinar to share your expertise.

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