



# Sharing Power: Aquariums & Community Groups Advancing STEM Literacies in Climate-Threatened Areas

The pilot test of a capacity building program for informal science learning institutions and community-based non-profits identified a new path for advancing community STEM literacies. The experiment established partnerships between aquariums and local non-profits in two cities to address environmental justice and social disparities in areas threatened by climate change. This work identified five recommendations to reset the role of informal science learning institutions, such as aquariums, so they can be more useful to their communities' resilience and justice work: 1) Allocate time to build relationships; 2) Develop a shared definition of resilience; 3) Situate community aspirations as context for STEM learning; 4) Redefine informal science learning centers' role as a service, not a destination; and 5) Commit to transparency and equity in funding.

Rupu Gupta, Nicole LaMarca, John Fraser, Kathryn Nock, & Kate Flinner

## Executive Summary

In 2017, the New England Aquarium (NEAq), with its partners, received National Science Foundation funding through NSF Grant #1713428 to pursue a project called Changemakers: Advancing Community Science Literacy (CASL). That project set out to develop and pilot test a capacity building program that leveraged a community change theory to build partnerships and advance community STEM literacies through informal learning programs. This report presents results of that work, which spanned three years.

NEAq and the Aquarium of the Pacific (AoP) were the informal science learning center (ISLC) partner organizations for this project. In this case, both ISLCs were aquariums, but we expect that other types of ISLCs, such as gardens and zoos, can also fill these roles. In the first year of the project, both ISLCs established City Teams by partnering with local non-profit entities working to address environmental justice and social disparities that trouble the people living in areas where threats will increase due to climate change.

The City Teams completed a training program, established a long-term partnership plan, and gathered "public knowledge" on both community threats and aspirations. The teams then set out to deliver co-programming that could work with social science-based recommendations for climate communication, as well as resources to support community dialogue. They also led some initial programming focused on developing STEM literacies. The process revealed asymmetries in the partnerships between a large public cultural institution (the aquariums) and their local partners, leading to greater interest in culturally responsive approaches to the collaboration.

As a result of the COVID-19 pandemic, a combination of furloughs, reprioritized work for remaining team members, and an overwhelming workload, the CASL final activities to a premature end in March 2020. Fortunately, the team members were able to transfer all records to the evaluation team at Knology so they could present the outcomes achieved for this project. Based on this information and the preliminary evaluation studies, Knology developed the following conclusions and recommendations.

**Allocate Time to Build Relationships:** Effective team work to develop symmetrical resources, power, and authority requires authentic, inclusive, and thoughtful participation. Results suggest that this process requires at least one year of meetings, shared workshops, social engagement, and budgetary commitments or alignment. This includes work to support partners in understanding and finding alignment between individual and organizational values and priorities.

**Develop a Shared Definition of Resilience:** The project demonstrated that ecological and social resilience represent different meanings for the communities most vulnerable to the adverse impacts of climate events. By focusing on the lived experience of people residing in ecologically vulnerable areas, we were able to understand how the co-morbidities of low socio-economic status and historical racial inequities impacted their relationship to where they live and how they want to improve conditions there. By incorporating the connectedness of human and environmental goals into the collaborative programming, the project was able to lay the foundation for equal partnerships and power sharing.

**Situate Community Aspirations as Context for STEM Learning:** By focusing on community aspirations, a new power-sharing collaborative laid the foundations for highly engaging collaborative programming that drove interest in learning about the local ecology and how human actions can adversely or positively affect them. The community-focused approach helped situate the literacy advancement in meaningful action. In this case, the ISLCs' role moved to a supporting position, leveraging their expertise as a complement to that of community partners. As a result, the project made the case for future initiatives to advance this line of inquiry and practice by prioritizing community organizing theory and professional development.

**Redefine ISLCs' Role as Service, not Destination:** ISLCs have the opportunity to leverage their trusted status in their communities by refocusing on service. This approach will look more like community organizing, where ISLCs support local social action organizations and participate in local initiatives that align with both partners' goals. The project demonstrated the need for a more pointed approach to community partnerships, by using community

organizing theory. As a potential field of study and practice for ISLCs, it emphasizes training and preparation to develop proficiency and can help staff at the ISLCs build cultural competencies that might not be part of traditional training in informal science communication.

**Commit to Transparency and Equity in Funding:** There are asymmetries in organizational resources among ISLCs and community organizations that require careful management. Small local community action organizations rely heavily on volunteerism and social networking, and funding is typically hard to come by. ISLCs on the other hand, tend to have more access to funding. Without clear funding to support the community development and training meetings in collaborative projects, local non-profits are not able to prioritize partnerships and might even distrust the ISLCs. Transparency in funding and allocation of resources to offset community partnership development is essential to maintaining an effective collaboration.

# Laying the Foundation: Summary of CASL in Year 1

In Year 1 of CASL, Knology conducted a City Team survey, two rounds of interviews with City Team members, and interviews with leaders from the partner organizations, to assess the first two intended outcomes for the project:

- Authentic community-ISLC partnerships, indicated by key factors of effective collaboration;
- Institutional change, indicated by increased buy-in for the work of CASL and for ISLCs' role as social assets;

In Year 1, we created and deployed a community member survey in order to understand a baseline measure of their community's science literacy. We also co-developed a workshop protocol with CASL Leadership to help them guide a workshop with their City Teams to assess community outcomes of the CASL project. The workshop was meant to obtain information from City Team members as informed observers to speak to observable community action and community science literacy. Lastly, in addition to these evaluation activities, Knology attended the CASL Mid-Point Check-in Meeting in Boston, MA October 10-12, 2018. During this convening, Knology presented the evaluation plan for the life of the project, and the findings to date from the first round of City Team interviews.

Our evaluation activities in Year 1 revealed a group of City Team members and leaders from a variety of community organizations that understood the benefit of collaborative work. The organizations in each City Team were able to deepen their relationships through CASL, and bolster their capability in serving their communities. Organizations' missions were also nurtured and supported by the dynamics and resources provided by CASL. By the end of Year 1 of CASL, the project had laid the foundation for the community organizations involved to begin addressing real environmental issues connected to the communities they serve.

We learned that for the City Teams, **relationship building was a critical first step**, which provided opportunities for these groups to authentically understand and appreciate each other's work. To create effective collaborations, partners needed to come together toward a shared vision, in which their respective roles were acknowledged and valued.

City Teams were engaged deeply in **learning about environmental topics** that concerned their communities. These endeavors helped surface the complexity of human-nature dynamics, which are integral in understanding how to move forward with effective solutions that consider both the wellbeing of the community members and the health of the earth. These fundamental connections and understandings are the **foundation for future change** and pre-requisite to creating stable, lasting community-wide shifts in behavior and culture. See *Communities Advancing Science Literacy: Year 1 Evaluation Report* (Gupta, Nock, LaMarca & Ardalan, 2019) for full details and evaluation findings of year one.

Additionally, a Community Survey documented a baseline level of science literacy, revealing a moderate degree of confidence and competence in science and climate literacy in both City Team sites. Participants reported feeling alarmed about a range of global issues, and most frequently engaged in donating money or time to environmental groups. Overall,

participants agreed about feeling that they could create meaningful change in their community. See *Topline Report: CASL Community Pre-Survey* (Nock, LaMarca, & Ardalan, 2019) for full results of the survey.

We also learned about the perspectives of community members through the informed observation of the City Team members during public events created through the project. We learned that community members were deeply concerned about the environmental conditions in the coastal areas where they lived, in addition to other disparities like limited affordable housing or green spaces. They were also deeply concerned about the negative impacts on their health and wellbeing. City Team members also felt CASL had helped foster community action, through local wetland restoration activities, for example. Overall, City Team members felt their work through CASL had helped capacity building and working towards common goals. See Appendix A for more details of the results from the City Team Workshops.

At the end of the first year, our evaluation indicated that City Team members and Leaders from their organizations saw the benefit in collaborative work, and were deepening their relationships with each other and with the communities they serve. CASL had helped support and nurture each organization's mission through the partnerships and resources it has provided.

## Project Progress & Outcomes in Years 2 & 3

Evaluation activities were significantly modified due to institutional closures, stay at home orders and staff layoffs in 2020. Originally, we had planned to do another city team workshop, a final round of city team interviews, organizational leader interviews and a discussion with the leadership team. These activities were not possible for many reasons including stay at home orders and limited staff capacity. After multiple iterations of re-scoping as current events rapidly changed, our plan to assess evaluation outcomes under these challenging circumstances was to conduct virtual interviews, and to analyze the reach and engagement of CASL events over the course of the project through an artifacts review.

### Methods

#### Artifacts Review

In Year 2 we created a document for NEAq and AoP to individually describe the artifacts they had compiled through the project. This was supplemented with specific instructions for each institution to detail these artifacts by completing a table organized by the types of information we requested. The first column asked for the category of the item they were logging, which included Physical artifacts, External communications, Internal communications, Event name, or Other. For each listed artifact, subsequent columns asked for the number of people reached, a brief summary, observations (if applicable), and reactions of the public (if applicable).

Analysis of artifact tracking was conducted separately for each institution, followed by a synthesized summary of the common themes across each that answered the relevant research questions for this project.

## Final Interviews

During the fall of 2020, we conducted two sets of interviews. For the first set, we reached out to ISLC staff from a range of departments and affiliates of the CASL project in both Long Beach and Boston to conduct *organizational staff interviews* (see Appendix B for the interview guide). We sought to speak with folks who were familiar with but not directly involved in the CASL project, who could speak to how institutional capacity to engage in more culturally responsive ways has changed, and what it means for communities to be more resilient in the face of a public health crisis. This set of interviews occurred in place of the originally planned *organizational leader interviews* due to significant staff changes at the institutions. Data collection response rates were low due to this limited staff capacity, and we ultimately spoke with three individuals. One was from a Membership Department, another from a Development Department, and the third was from one of the community partner organizations.

For the second set of interviews, we spoke with webinar attendees (see Appendix C) who participated in the Frameworks-led and aquarium-hosted “From Crisis to Connection: How to Talk about Health, Wellbeing, and Resilience in the era of COVID-19” webinar, which occurred in August 2020. Knology reached out to attendees who agreed to be interviewed through a survey sent by NEAq shortly after the event. These *webinar participant interviews* sought to understand how the webinar has contributed to their professional development. Due to limited capacity of aquarium staff, we were able to speak with two individuals, one staff member from each of the two aquariums.

All interviews were conducted by a Knology researcher and analyzed for major themes in response to the research questions. Responses from both interview sets are considered here in aggregate.

## Results

### Climate Resilience & Literacy

#### Knowledge & Awareness

##### *Artifacts Review*

The Artifacts Review of products, events, and resources created through CASL provides insights on how institutions, as exemplified by NEAq and AoP, can play a role in climate resilience and literacy in their communities. These insights related to specific pre-determined project outcomes as we describe below.

In East Boston, science-focused information was shared as it relates to the local ecology, including the ocean and the flora and fauna connected to the community. For example, events highlighted local whale species and how human activities affect them, aiming to create awareness about the interconnectedness of different species. These events promoted an awareness of local outdoor spaces and the animals that live in industrialized areas,

offering a glimpse of hidden nature and sparking interest in learning and exploring them further. Overall, these events created opportunities for residents to connect with nearby nature, and learn how their lives are mutually tied together.

In Long Beach, the focus seemed to be on heightening awareness of the priorities and experiences of residents as a way to further build community capacity, with the help of multi-media strategies. The emphasis was on getting to learn about the varied interests and stories as a way to enable more bonding and communication between people. Excerpts from the Sharing our Stories activities illuminated the strong bonds that already existed in the community, including how residents feel deeply connected to Long Beach and different aspects of its diversity, rely on their neighbors, and brainstorm community challenges together. We see these efforts as expanding the scale of connections so that people from different parts of the community acknowledge their shared values.

With an internal project team focus, a webinar helped staff at the two aquariums expand their understanding of the socio-cultural influences on how people think about public health and resilience. As a way to build internal capacity to engage their public audiences, participants said they understand how they could apply the learning to their work.

### *Final Interviews*

Staff members were quick to share that COVID-19 had halted all community events during the interviews which made it challenging to speak regarding program impacts on knowledge and understanding of topics relating to resilience. However, staff members did note that recent events like protests to end systemic racism, in addition to COVID, had heightened the need to make the community aware of the educational resources the aquarium.<sup>1</sup> These events also illustrated the opportunity for the community to see the aquarium as not only a place to visit but also as a community resource.

Other social justice events that were coincident with the pandemic, like the Black Lives Matter movement, also resulted in interviewees learning more about local environmental and social issues, and the intersectionality of these issues that face the community served by their institution, including issues of inequity and injustice in healthcare. For example, staff who attended the webinar training felt it prepared them with the language and narrative techniques for speaking with visitors and community members about the intersectionality of climate, resilience, health and systemic racism. One participant said “[The webinar] added to my toolkit of communication strategies [for discussing resilience].” Another webinar participant said they feel more prepared to confront visitors who aren’t wearing a mask after participating in the event.

### **Community Action**

#### *Artifact Review*

In both East Boston and Long Beach, we saw opportunities for future action in the communities as a result of the various events and multi-media outreach strategies that had been created to engage with their community members. In East Boston, residents expressed

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<sup>1</sup> Please note that throughout the results section of this report, references to “the aquarium” intentionally do not identify the specific aquarium referred to in order to protect the identities of interview participants.

strong interest in being involved in civic activities that enabled them to be part of decision-making processes related to critical local issues (e.g., affordable housing, environmental cleanups). In Long Beach, residents indicated being able to rely on their neighbors and their community partners for personal matters, as well as for collective action that was meaningful to their communities. This included tending to a community garden, working with environmental justice organizations for quality-of-life concerns, or generally taking an active stance for their community's benefit. The artifacts highlighted the social capital fostered in these two locations, suggesting opportunities for the aquariums to collaborate with their community partners towards these possibilities.

#### *Final Interviews*

At least one staff member hoped the pause of reflection caused by the pandemic would lead to increased interest in learning more and listening to solutions to climate and community resilience on both an individual level and from the perspective of ISLCs. Deeper connections between ISLCs and the communities they serve provides the opportunity to expand on ideas of what resilience means and the embedded social issues surrounding climate resilience. For example, one interviewee said they now *"have to talk about things that aren't our expertise, but all part of a larger process to move towards community."*

In addition to the importance of strengthening relationships between ISLCs and the communities they serve, individual relationships within communities were also seen as beneficial. One staff member, who participated in the webinar, discussed that what they learned in the webinar helped them realize that resilience can simply mean *"staying safe and helping out the community. To be resilient...we need to work as a community."* They described that in times of crisis, everyone is negatively affected regardless of their economic class or demographics, and everyone is in this together.

### **Successful Partnerships**

#### **Relationship Building**

##### *Final Interviews*

The relationships built through CASL brought about a rethinking of what resilience means in response to what community members from different groups prioritized. It also strengthened the foundations of relationships that staff saw as essential to bringing positive change to the city.

All three interviewees claimed that the relationships built were the greatest impact of the CASL project, and were critical for building connections, awareness and resilience in their cities. One staff member said that since CASL, *"the shift [has been] having access to new relationships where before we might have been in the dark of where to start. And those communities know that we actually care, that we're not just launching this program to get their money but that we want them to feel welcome and a part of our work here."*

One staff member said this program set a foundation for how to approach community problems and create community solutions. They saw that this strengthened their relationships and networks to and within the city, allowing those involved to connect with the city in new, different, and meaningful ways. This staff member said, *"Long Beach is this*



*cool big city but little town feel so giving us opportunity to connect with city in different and meaningful way and it relies on those relationships to continue.”* Another staff member recognized that this work *“this sort of work is really key at the kernel stage, because it’s really slow and needs more than one round to build those relationships.”*

## **Institutional Change**

### *Final Interviews*

The CASL pilot study gave both participating aquariums the opportunity to rethink their role in the community. According to at least one staff member, a silver lining of the pandemic has been that ISLCs have been pushed to think strategically about how to approach their work differently, including how to serve the institution’s mission in different ways. One staff member said, *“It has challenged us to consider that we could be an active participant in a conversation rather than a facilitator of information.”*

One staff member said, *“CASL is one of the first opportunities [the aquarium] has had to test itself in being a good neighbor and being part of the community.”* This was seen by some staff members as shifting from giving the community what the aquarium thinks they need, to instead listening and being willing to adapt and shift what they can offer. They described seeing the start of a shift to building stronger relationships with the community by prioritizing trust and relationship building, as well as listening to community needs. Staff members interpreted the shift as a long-term opportunity for the aquarium that faces obstacles because the systems that are in place make it so that operations are often contingent on the number of people that come through the doors and buy tickets.

We also heard that CASL gave aquariums opportunities to engage in new ways with different sectors that they previously did not typically work with. Primarily, staff members were committed to changing the way people think about aquariums, and seeing these centers as a part of the community. Like the staff who said, *“some people just see us [the Aquarium] as a place with cute animals, but getting people to understand we are a broader educational type institution with information that can be helpful for our community.”*

Additionally, calls to end systemic racism has brought diversity and inclusion in hiring and board representation to the forefront. The sites are said to have cared about this in the past but now it is a much stronger objective in order to best represent and serve the community the institution serves.

## **Value of the Model**

All interviewees felt that CASL aligned with the aquariums’ missions, and challenged staff to think more creatively and innovatively about how they serve their communities. This work also pushed participants to think strategically and inter-departmentally to address the diverse topics the CASL project raised. Staff shared that inclusion and diversity have always been a part of their institution’s mission, but it has never been more important and relevant as it is now. They felt their institutions were committed to strengthening relationships and representations of the community. As one staff said, *“We wouldn’t be an aquarium without the community we serve,”* and remain committed to rethinking the role of aquarium as a part of the community.

## Artifacts Review: Additional Results

### NEAq

In collaboration with their partners, NEAq developed a number of media outputs to engage with the public about the connections between science and their local communities. These included physical signs specific episodes on the What's up Eastie radio show local to East Boston, focusing on science in relation to the sea, advancing science literacy through the show, and Science on the Shore. The content and graphics of the physical signs were co-created with Eastie Farm staff and volunteers. Similarly, youth who participated in Climateens, and the Sounds of the Sea event were engaged to create PSAs about ocean noise pollution. Youth at Eastie Farms recorded and edited the PSAs for radio. Moreover, the host of the show had started to showcase the project during one show each month, where he would interview residents and highlight their community work, while sharing science content for listeners.

Supplementing these were the following two public events. One was Sounds of the Sea, a public orchestral performance that featured "animal song and video representations of sea life woven together with classical favorites." The event included a documentary screening with a panel discussion and a NEAq Whale Watch, and was followed up by a radio segment on "What's up Eastie?" NEAq conducted its own survey of attendees ( $N = 70$ ), which indicated that more than 80% of attendees had learned something new and gained appreciation for whales and NEAq research, and were able to describe actions that they and their communities could take to protect the ocean and its animals. The most frequently mentioned actions included individual-focused activities (e.g., recycling and composting) and more civically focused activities (e.g., contacting a representative, volunteering time or money to nonprofits, voting to protect the ocean), and making informed consumer choices.

The other event was the Chelsea Creek BioBlitz, a collaboration with Harborkeepers in an industrial area that offers seemingly limited options for outdoor exploration. Using the Harwood Institute technique of community conversations, a NEAq staff member engaged participants in learning about their experience at the event. All seven participants who spoke with the staff members said they had learned something new about Chelsea Creek and would be interested in exploring the area more to observe animals there. Their aspirations for their community involved more outdoor events, accessible to all, for connecting with each other, through family friendly events, for example. They were concerned about pollution, housing instability and gentrification, and the lack of awareness and education about engaging politically. They felt their community could be empowered through opportunities to learn and engage with residents from various backgrounds, and through civic actions such as attending meetings, voting in local elections, and advocating to legislators. They were especially interested in engaging government money in the community to provide affordable housing and environmental cleanups. The events and media programs collectively reached at least 200 individuals in the community. What's Up Eastie, for example, reaches approximately 100 people in each show.

## AoP

In collaboration with its partners, AOP developed a number of promotional materials, including a flyer for the Sharing our Stories event to celebrate community knowledge and experiences, hosted in partnership with Khmer Girls in Action (KGA), Long Beach Forward (LBF), and Friends of Colorado Lagoon (FCL), as well as a press release for the League of Women Voters (LOWV) Climate Change Symposium at AOP. At the Sharing our Stories event, KGA members shared poems they had written about their relationship to the people and nature in their communities. At the LOWV event later on, these poems were highlighted in a ceremony, where KGA was awarded a prize for climate change arts.

At the Sharing our Stories event, questions were posed to attendees as part of a storybanking activity to learn more about the residents. Questions included what they loved most about Long Beach, how they've seen it change, and how they worked with other residents when facing challenges. People were able to respond to these with post-it notes to share their experiences. At a future event, some of them were excerpted with photos, and translated, printed, and posted to showcase residents' perspectives for community building. Similarly, videos of residents sharing their stories were created, edited, and shared in a loop at the event. AOP staff observed that they helped connect audiences to the authentic, shared values within their community. The videos continue to be a useful resource internally at AOP for staff training and teacher workshops. Staff appreciated this first step their organization had taken to actively engage in community-focused work, helping them build their own capacity to do the same.

The public events collectively drew in more than a 1,000 people, indicating the substantial reach of the work. AoP staff described the poetry that sprung from this collaboration as an unexpected benefit of their shared work. The lead at AOP also conducted a virtual presentation with the Long Beach Sustainability Commission to showcase the ongoing collaborative work focused on community resilience with all the local partners.

## NEAq & AoP

In summer 2020, both institutions hosted a 90-minute webinar co-developed with Frameworks Institute for their staff entitled "From Crisis to Connection: How to Talk about Health, Wellbeing, and Resilience in the era of COVID-19." The goal was to learn about socio-cultural models that influenced thinking around public health and resilience. A total of 12 staff joined the webinar across the two institutions. NEAq and AOP reported that a participant survey of 10 staff indicated that everyone had found the content interesting and most thought it was very much so. Most thought the content was extremely relevant to their work and that they anticipated applying it to their work in the short-term. Reflections on this webinar are presented in the following section.

## Staff Interviews: Additional Results

Despite the obstacles presented by COVID-19, interviewees saw CASL as a beneficial program that continued to strengthen relationships between ISLCs and the community over the life of the project, and shift away from the traditional idea of how a museum serves its community. Staff members shared particular appreciation for the way CASL broadened how

they define resilience, continued to grow their networks, and prepared them to communicate about the challenges of our times.

The webinar attendees we interviewed found the event to be a useful and relevant professional development experience on framing and communication strategies. Attendees appreciated the framework provided during the webinar regarding language and narrative to use to discuss these challenging topics that include conversations around COVID-19 and the recent calls to end systemic racism. Both participants we spoke to really liked the webinars, appreciated their formats and hope to see more of them. One suggested doing additional webinars that provide resources and encourage discussion about diversity and inclusion.

The financial cost of community organizations committing to collaboration with ISLCs emerged as an important factor that affected the success of the project. Over the course of the project, staff from one aquarium observed that staff members from some community organizations had to be reassigned to different projects when the organization couldn't justify the cost of maintaining multiple people's involvement in CASL. After some initial success with the partnership, another community organization could not sustain its work on CASL and stopped work on the project. In discussions and written communications with partner organizations, ISLCs staff heard that \$10,000 to \$15,000 per year (\$USD 2020) for these organizations would be a minimum funding expectation to encourage continuing the partnership.

## Implications & Recommendations

The CASL project ended in the context of a tumultuous year mired with a global pandemic, an intense national reckoning around racism, and record-breaking environmental tragedies. As an endeavor to advance the role of ISLCs as catalysts for building community science literacy, the project has learned from these multiple societal crises, highlighting the promise and the challenges for ISLCs setting out towards community engagement goals. Our explorations of what climate resilience partnerships require to be successful and how institutions play a critical role in climate resilience and literacy indicated consistent themes over the three years of the project.

### Allocate Time to Build Relationships

From the very first year of the project, the value of relationship building was a prominent theme and underscored the need for ISLCs to be authentic, inclusive, and thoughtful in engaging with community partners (Gupta, Nock, LaMarca, & Ardan, 2019). Although time-consuming, effortful, and emotionally challenging, this approach was identified as a prerequisite to enable specific project outcomes, (e.g., science literacy and its application to protect local ecology). Getting to know partners whose environmental values and priorities differed from that of the aquariums (e.g., needing healthy green spaces, improved air quality) drew attention to the communities' environmental justice needs that are prime concerns that needed to be addressed.

The extent to which a potential collaboration could help tackle those goals depended on acknowledging the divergent affordances that community members held in relation to their ecological environment as found in discourse on environmental narratives (Fraser, Gupta, & Krasny, 2014). Relatedly, a level of cultural competence was essential, where those differing views recognized, respected, and fostered mutual understandings of each other's perspectives (Gupta, Fraser, Rank, 2014). These themes started to develop at the end of the first year, as the community and aquarium partners developed public-facing events, and each organization leveraged their expertise or assets in unique ways.

As the project neared completion in the time of the multiple crises of 2020, the importance of cultural competence was further emphasized. The systemic inequalities in access to health, safety, and a quality of life received national attention, bringing to light those same issues in the community contexts where the ISLCs aimed to foster partnerships. This led to renewed interest in developing strategies and approaches to enter into partnerships with humility and transparency, acknowledging the power differences apparent between the partner organizations, and taking an anti-racist stance by aquarium partners who remained after the multiple rounds of layoffs.

### **Develop a Shared Definition of Resilience**

The concept of *resilience* has been heavily studied in academic and environmental literature, yet its focus continues to be on the physical, natural, and structural changes in areas that are most likely to be affected or already affected by climate change (Overseas Development Institute, 2016). The CASL project highlighted the value of being open and receptive to community perspectives on what this abstract idea means to residents, using this as a guide to plan collaborative projects. Shifting practice in climate resilience contexts, the focus was on the phenomenological experience of people living in ecologically vulnerable areas (e.g., at risk of rising sea-levels for both aquariums), most of whom are economically disadvantaged and communities of color. This approach revealed their hopes for community resilience. For example, one of the case study sites community members indicated their interest in bonding more with their neighbors and building social capital. In both sites, the connectedness of human and environmental goals was highlighted, whether through reducing air pollution for cleaner air, having greener spaces for recreational and educational uses, or learning how people impact their local waters.

The pandemic further drew attention to additional risks that were perhaps invisible in these communities, that further exacerbated their economic conditions and compromised their physical health. These newly emergent realities were acknowledged by staff as the project ended, with the hope of incorporating them into future community engagement efforts.

### **Situate Community Aspirations as Context for STEM Learning**

Without explicitly describing the value of science learning, community perspectives and the eventual public-focused projects revealed a strong interest in learning about the local ecology and how human actions can adversely or positively affect them. Moreover, the interest went beyond knowledge acquisition to using it for meaningful action. We see the potential in such community-focused efforts in creating opportunities that can help democratize science learning for the public in real-world contexts, beyond those available in

formal or informal settings. We know that the public encounters STEM learning opportunities in a variety of places in their daily lives, with zoos and aquariums having an advantage in relation to their animal focus (Gupta, Voiklis, Rank, Dwyer, Fraser, Flinner & Nock, 2020) as well as being trusted entities for the public on topics relating to the environment (Dwyer, Fraser, Voiklis, & Thomas, 2020). For ISLCs, in particular zoos and aquariums, the potential to leverage their own expertise and complement that of community partners to advance science learning for action in vulnerable areas is promising. It is up to individual institutions to structure their internal policies to invest in inclusive efforts and create equitable science learning opportunities for the public.

### **Redefine ISLCs' Role as Service, not Destination**

It was increasingly evident over the life cycle of the project, that to create meaningful climate resilience partnerships, ISLCs have to expand their trusted status in the local context for partners who serve disadvantaged communities. While this is painstaking, often emotionally difficult work, staff at the ISLCs have gained greater awareness of the need to prioritize cultural competencies and skill building for staff to more authentically work with communities. They attribute their new understanding to the efforts of project staff who have demonstrated a pathway for their colleagues to adopt in the future.

For many institutions, including those in the case studies, leadership's role in shepherding a culture shift towards community engagement will be a critical first step. Enthusiasm among staff has to be supported with deliberate learning and capacity building opportunities throughout the institution to change their outward-facing role. For the CASL model to be successfully put to practice, institutions will need to demonstrate a commitment to authentic learning around community organizing principles, by prioritizing professional development for staff. Community engagement is its own field of study and practice and will require learning, training, and preparation to develop proficiency in it. To create authentic relationships and collaboratively effect change, institutions will need to be transparent, open-minded, and respectful of diverse perspectives, so that ownership is possible for all involved (e.g., Arnstein, 1969; Pyles, 2020). These considerations are especially important in climate resilience contexts, so that community residents become active change agents instead of being passive recipients.

### **Commit to Transparency and Equity in Funding**

The asymmetries in organizational resources required substantial attention and negotiation throughout the project. The pilot study allocated insufficient resources to ensure continuity in meeting attendance and priority setting, leading to challenges for the ISLCs.

Without clear funding to support the community development and training meetings, local non-profits might distrust the larger ISLC. While not explicitly stated by the ISLCs or the community organizations, the evaluation team hypothesized that this concern was offset by the credentialing that came from being a named associate of a well-known local cultural leader. However, that concern did not lead to making the collaboration a priority. To engage and sustain community organizations in partnerships with ISLCs, they will require annual support of \$10,000 to \$15,000 (\$USD 2020). When partnerships increase co-programming and sharing assets, these investments will also need to increase.

When it comes to planning and scheduling, community organizations are often smaller and more nimble than ISLCs. Where ISLCs plan budgets on an annual basis, small non-profits tend to be more dynamic, prioritizing projects as financial opportunities emerge. Transparency in budgeting and allocation of funding to offset community partnership development is essential to building an effective collaboration.

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Gupta, R., LaMarca, N., Fraser, J. Nock, K., & Flinner, K. (2021). Sharing Power: Aquariums & Community Groups Advancing STEM Literacies in Climate-Threatened Areas. *Knology Publication #GOV.052.488.05*. Knology. <https://knology.org/article/sharing-power-aquariums-and-community-groups-advancing-stem-literacies-in-climate/>

Date of Publication January 11, 2021

Knology Publication # GOV.052.488.05



These materials were produced for Changemakers: Advancing Community Science Literacy, a research project funded in part through The National Science Foundation Award #1713428. The authors are the independent external evaluators for the project and are solely responsible for the content in this report.