Knology

A Summary Report for the New England Aquarium

Climate Resilience & Communities

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Executive Summary

The National Network for Ocean and Climate Change Interpretation [NNOCCI] is a Community of Practice [CoP] dedicated to advancing the conversation on climate change, based on the principle that wide-scale training with proven communication techniques can change the national discourse around climate change to be more productive, creative, and solutions-focused.

NNOCCI is a self-governing network of individuals and organizations in formal and informal education, the social sciences, climate sciences, and public policy. By 2018, the community represented more than 184 institutions in 38 states. By 2022, we can estimate that more than 40,000 NNOCCI members have received training. The community shares a commitment to using **evidenced-based communications** methods and providing the **social and emotional support** needed to engage as climate communicators. The CoP believes that through collaboration, it can continue to develop knowledge, techniques, community, and confidence to empower audiences to act on climate change.

The CoP considers all members to be equal partners in the success of the initiative, and that all members have the ability to innovate and adapt, to share their successes and learnings with the community, and to contribute their work to the whole. The network also encourages others to join, to share what they can, and to derive benefit from the social support, scaffolding, and resources that they share. The assessment rubric used to monitor this aspect of the CoP was developed by Wenger, Traynor and de Laat (2011).

As a self-governing community, NNOCCI colleagues continue to experiment, evaluate, and share successes within the network and with new communities. The community is committed to learning about the latest findings in climate science, oceanography, and the social sciences, and to applying this knowledge in their contexts. The community invests personal time and effort to build trust and lasting bonds among community members across the country who share an interest in developing effective ways to engage audiences in learning about and taking action on climate change.

The New England Aquarium, in collaboration with FrameWorks Institute, Woods Hole Oceanographic Institute, and Knology (formerly NewKnowledge), were the founding entities that laid the foundation for NNOCCI. Representatives of these organizations provided seed content to the initial community and served as members of the committees that launched the network with funding from the National Science Foundation. These representatives also served on the initial self-governing committees as the network matured.

In 2016, the NNOCCI Research and Development committee acknowledged that initial efforts were successful in supporting interpreters in zoos, aquariums, nature centers, and parks. A social network analysis revealed a strong central network of interpreters. Though fragilities existed in the American South and Southwest (where climate change denial was more widespread, and where legislation restricting speech limited public action), these were not considered fatal to the growth of the network.

In 2016, the NNOCCI R&D committee prioritized three areas for expansion: community-based organizational partnerships with the cultural institutions that had NNOCCI-trained leadership; youth programming as a unique domain for climate communications action; and the role of NNOCCI-trained communicators in bilateral partnerships with other climate empowerment groups.

In service of these growth goals, in 2017, the New England Aquarium developed and received funding for four grant-funded initiatives to pursue research and pilot programming that would expand these aspects of climate communications to support innovation and skill development with the NNOCCI CoP.

The four projects were:

- Communities Advancing Science Literacy (**CASL**), a National Science Foundation-funded planning project, Fall 2017 – Fall 2020;
- Civic Leadership for Issues in Science and Society (**CYCLIST**), a four-year Institute of Museum and Library Services funded project, Fall 2017 – 2022;
- Community Partnership for Resilience (**CPR**), a three-year Environmental Protection Agency-funded pilot project, Fall 2017 – Fall 2020; and
- Promoting Education through Action for Conservation of Habitats (**PEACH**), a two-year National Oceanic and Atmospheric Administration Environmental Leadership Grant, Fall 2017 – Fall 2019.

With the onset of the COVID-19 in 2020, the projects that were not complete experienced substantial disruption, staff attrition, loss of social capital following staff attrition, loss of access to program participants, institutional resource losses, and extended timelines to complete the project as intended given the impacts of the pandemic. Despite those disruptions, each project was completed, and generalizable new information emerged that is detailed in this consolidated report.

Generalizable Results

CYCLIST

Civic Leadership for Issues in Science and Society (CYCLIST) was a consortium of seven informal science learning centers (ISLCs) working to expand a Community of Practice (CoP) to advance youth civic engagement through environmental issues like climate action.

The four-year project demonstrated that youth engagement programming has shifted substantially for the post-pandemic generation. Pandemic-related staff losses and lost institutional knowledge made it unclear what youth programming would look like under new leadership. By working with youth, and focusing on rebuilding capacities for virtual programming, a small group redefined where priorities should be placed to support youth in a world that increasingly combines the hybrid space of remote virtual relationships with in-person local connections. The result was an understanding that youth are willing to leverage their online skills to complement live activities, and that hybrid programs seem to be the inevitable future for informal learning centers. The program developed a new toolkit that highlights how youth culture is shifting. At this writing, it appears from their work that youth highly value equity, respect intersectional identities as authentic ways of knowing, and ground their work in the principles of justice and collaborative action. Youth are confident in their ability to lead as part of a group, seek guidance to take action, and can coordinate themselves when allowed to thrive.

CYCLIST was initially envisioned as an incubator for new NNOCCI tools and techniques for youth climate leadership. While the pandemic and leadership changes led to a small working group focusing on a program toolkit and their shared practice rather than contributing to the larger NNOCCI CoP, the result was a new small CoP that has complementary skills and a unique disciplinary knowledge that can now provide value to the NNOCCI CoP if the CYCLIST group works to build bridges. By identifying how the NNOCCI CoP's resources can support the CYCLIST CoP, and vice versa, it may be possible for both to achieve greater impact.

CASL

Communities Advancing Science Literacy (CASL) was a two-year NSF project that brought the original NNOCCI partners into an experimental extension of NNOCCI principles to possible bilateral partnerships between large well-resourced aquariums and small community-based civic action groups supporting under-resourced communities in climate-related high-risk settings. The NNOCCI leadership teams were joined by the Harwood Institute for Public Innovation and the Aquarium of the Pacific to explore how informal science learning centers could serve as catalysts for building community science literacy. The pilot experiment invented the concept of City Teams, in which partner community organization members addressed community issues, resilience, and remediation action plans.

The pilot test identified a new path for advancing community STEM literacies that has the potential to increase the utility of the NNOCCI methods. It brings much needed diversity in focus, action, and perspective, but is not without risk. The scale of these partnerships requires careful navigation to ensure that equity is at the center of the partnership. Open discussion about budgets, planning schedules, and resource needs are essential to establish trust. Small community-based organizations recognize that partnering with a large cultural institution enhances their prestige and authority. However, many small cultural groups have had negative experiences with large cultural organizations, who sometimes use them to show their major funders that they reach excluded groups.

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 a 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.

CPR

This project aimed to foster partnerships among students, schools, community groups, and local governments in coastal localities that are particularly vulnerable to the impacts of a changing climate. Like all other NNOCCI family projects, this effort aimed to develop a community of practice (CoP) among the teams. Like the CASL project, the time and effort for equitable engagement was critical effort. It revealed the need for meta-cognitive process work by all partners, and described how each partner would realize value for their goals, how each organization could equitably allocate both fiscal and physical resources, and what each thought they could offer to others. When that work was instigated through self-evaluation discussion and externally facilitated dialogues, respectful, collaborative relationships emerged. And together, the group could then find ways to advance youth driven community climate work. The CPR toolkit for educators is an important tool that could benefit the larger NNOCCI community of practice to aid in creating new bilateral community-based partnerships. Some of these findings were subsumed into the Cyclist products, and together, they represent a new opportunity for NNOCCI expansion.

PEACH

Unlike the other NNOCCI experiments with youth and community-based programs, Promoting Education through Action for Conservation of Habitats (PEACH) aimed to increase awareness of environmental issues and knowledge about local habitats based on partnerships of similarly situated cultural organizations (including National Parks of Boston, Emerald Necklace Conservancy, Trustees of Reservations, and Massachusetts Audubon). This concept of cultural collaboration and alignment of goals, missions, resources, and shared

activities represents a transition from a competitive model of business toward a more democratic model of shared work for shared outcomes. The two-year project demonstrated that a new collaborative "muscle" is possible, and that collaboration between volunteers from different organizations can contribute to the idea of a culture of conservation rather than organizational affinity groups that silo work. Partners found that while initially perceived as time intensive the collaboration resulted in highly valuable outcomes that helped all groups expand their capacity, further their mission, and solidify their conservation-specific outcomes. More importantly, they attributed their social connections as mid-level staff with shared values and practices as crucial to the success of their organizational missions. The collaborative work helped all of partners realize expansion and diversification of their volunteer bases, and shifted the focus of volunteer training from specialized to more generalized skill development with greater potential for activating a culture of conservation.

Summary Findings

In principle, these four research projects demonstrated that democratic processes fostering a community of practice across local and national networks focusing on similar issues can be a valuable way for reaching conservation goals with groups. By employing reflective practice, (that is, tools that draw attention to how a person receives and offers value to the group), the time and effort returns greater outcomes than the cost of investment. Community of Practice work also fostered greater ability to diversify participants and increase engagement in the service areas where CoP members were working.

A few critical principles learned through these efforts included the need to acknowledge and share fiscal asymmetries between small and large organizations, to schedule planning windows, and to identify how past experiences may lead to distrust. While money is always uncomfortable, the projects demonstrated that collaborative work is stronger when funding structures are transparent, that all parties need to be aware of the cost of time and effort, and that smaller and less well-funded organizations should receive equitable funding—even if that means their compensation may allow for more time than a larger organization.

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Introduction

In 2017, the New England Aquarium (NEAq) initiated a multi-pronged effort to examine how informal science learning centers (ISLC) can address climate resilience through community-focused partnerships. This effort built on the established model built through the National Network for Ocean and Climate Change Interpretation (NNOCCI), a collaboration between NEAq, Frameworks Institute, The National Aquarium, Association of Zoos & Aquariums, Monterey Bay Aquarium, & Woods Hole Oceanographic Institution, and Knology (formerly known as New Knowledge Organization Ltd.), the research and evaluation partner. The project aimed to build capacity among ISLC educators and interested scientists, changing their professional practice and contributing to the nationwide uptick in dialogue about climate change.

To examine how ISLCs can support collaborative community-focused works, three federally funded projects were developed: Communities Advancing Science Literacy (CASL), Community Partners for Resilience (CPR), and Capacity-Building for Youth Civic Leadership for Issues in Science and Society (CYCLIST). While originally conceptualized as discrete efforts with separate funding streams, with the passage of time, meaningful overlaps in project foci emerged, which facilitated a process of conceptual rethinking. This process identified two overarching research questions that all three projects sought to answer in distinct ways. As the research and evaluation partner, Knology, in collaboration with NEAq, identified specific outcomes to study in relation to each question as shown below:

1. What do climate resilience partnerships require to be successful?
   - Relationship building
   - Value of model
   - Institutional change
2. How do institutions play a critical role in climate resilience and literacy?
   - Youth skill development
   - Knowledge and awareness
   - Educator skill development
   - Community action

This Report

Each project focused on unique combinations of these outcomes to address the research questions, in alignment with their specific project model. For ease of reporting, we created a master report which will include results of individual evaluation activities from each project. Findings from each evaluation activity will be presented as separate chapters within this report, in order of their completion. We aim to document common themes that cut across these projects, and identify how each contributes to the larger model for building community/ISLC partnerships. We believe this will advance our understanding of the role informal science learning centers can play by building on our original work with the NNOCCI

community of practice. We note that the onset of the COVID-19 pandemic in spring 2020 necessitated the reframing of evaluation activities for all projects to reflect the shifting circumstances for staff at NEAq and its partner organizations.

The overarching research question across these projects was further refined to understand how informal science learning centers build capacity to develop community-oriented partnerships, including those that can be resilient in the face of disturbances like the current public health, economic, and social crises. More detailed changes will be described in relation to specific evaluation results presented for each project. In collaboration with NEAq, we aimed to ensure that evaluation activities were attentive to the different community and organizational contexts as a result of the pandemic, while also capturing the overarching research questions.

Project Overviews

Communities Advancing Science Literacy (CASL), led by NEAq in collaboration with Frameworks Institute, the Harwood Institute for Public Innovation, the Aquarium of the Pacific (AoP) and Knology, sought to advance informal science learning centers (ISLCs) as catalysts for building community science literacy. The National Science Foundation funded project (NSF grant #DRL-1713428) was initially planned to span two years, but was extended to cover three and half years. The two ISLCs, NEAq in Boston, Massachusetts, and AoP in Long Beach, California, worked with multiple community organizations to provide evidence of the value of partnerships in fostering community change. Each City Team consisted of 10-12 people from the ISLC and community organizations, who participated in trainings led by the Harwood Institute to develop a shared understanding of resilience.

During the second year, to continue the project work (especially its public facing components), an extension was obtained from the funder. This continued work coincided with the onset of the pandemic, when another extension was obtained, since much of the remaining work needed to be paused. Additionally, in spring 2020, the City Team in Boston underwent an unexpected change. Due to emerging circumstances their work with community partners ended prematurely. NEAq harnessed this situation as an opportunity to learn from the experience and focus on strengthening its internal capacity to engage more meaningfully with community partners.

These shifting circumstances were incorporated into the evaluation plan, in discussion with NEAq, to support the reframed goals of the project. Knology aimed to answer the two main research questions with a focus on the following outcomes:

1. What do climate resilience partnerships require to be successful?

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

2. How do institutions play a critical role in climate resilience and literacy?

- Increased community science literacy in terms of gains in content knowledge and perceived relevance of environmental challenges for City Team members and community members; and

- Observable community action, with indicators of movement toward community-defined goals.

The **Community Partnership for Resilience** (CPR) project, funded by the National Oceanic and Atmospheric Administration (NOAA, award #NA17SEC080001) aimed to foster partnerships among non-governmental community leaders, local governments, and schools in three Massachusetts-based coastal communities: Chelsea, Hull, and Lynn. CPR was a three-year project intended to develop youth-led public education projects to increase public science literacy and community engagement in climate resilience. Partnering with the Harwood Institute to achieve this, CPR's overarching goal is to create a scalable model for youth-focused community partnerships to advance climate literary and community involvement.

CPR has already undergone two annual evaluations, in which the presence of a Community of Practice (CoP) both across and within municipalities was assessed.

In the third and final year of the project, the evaluation led by Knology, focused on the following specific outcomes in relation to overreaching research questions described in the introduction:

1. What do climate resilience partnerships require to be successful?

- Development of a Community of Practice (CoP) among the CPR teams in each municipality;
- Perception of long-term value of the CPR model for all partners involved.

2. How do institutions play a critical role in climate resilience and literacy?

- Development of public and youth climate literacy, including awareness of relevant environmental topics, in the participating municipalities;
- Development of skills and insights around climate resilience planning in project participants.

The **Capacity-building for Youth Civic Leadership for Issues in Science and Society** (CYCLIST) project built a national community of educators from informal science learning centers (ISLCs) to support teenage youth in developing civic engagement skills to address issues at the intersection of science and society. This Institute of Museum and Library Sciences (IMLS)-funded three-year long project was led by NEAq, and brought together six other ISCLs: the Alliance for Climate Education (ACE), Audubon Nature Institute, Mote Marine Laboratory & Aquarium, Saint Louis Zoo, Woodland Park Zoo, and the Wild Center. In Year 3, six additional ISLCs were invited to join the project.

CYCLYIST's three main goals were organized as follows to answer the overarching research questions:

1. What do climate resilience partnerships require to be successful?

- Build supportive social networks of ISLC educators around shared goals.

2. How do institutions play a critical role in climate resilience and literacy?

- Improve professional practices to support youth civic engagement as a new standard component of programs at various institutions; and

- Devise ways to incorporate civic engagement into youth programs.

Promoting Education through Action for Conservation of Habitats (PEACH) sought to increase awareness of environmental issues and knowledge about local habitats among Boston-area volunteers, and develop skills for making informed environmental decisions. Through Environmental Protection Agency funding, PEACH brought together the New England Aquarium, National Parks of Boston, Emerald Necklace Conservancy, Trustees of Reservations, Massachusetts Audubon and Speak for the Trees Boston to provide resources, collaborate, and build capacity in each of the project partners. At the conclusion, project partners felt their volunteers had gained skills in responding to local conservation issues. Partners found the collaboration with project partners and other organizations to be a highly valuable outcome of PEACH, helping them to expand their capacity, further their mission, and solidify PEACH's specific outcomes. The partners felt that future collaboration and connection would be crucial to the success of their organizational missions by expanding and diversifying their volunteer base, and recommended a shift in the focus of volunteer training for each organization's specialized goals to promote more generalized skill development.

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Supporting Informal Educators & Youth Civic Engagement

Capacity-Building for Youth Civic Leadership for Issues in Science and Society (CYCLIST) aimed to build a Community of Practice (CoP) to help youth develop the skills needed to address issues at the intersection of science and society. With funding from the Institute of Museum and Library Sciences (IMLS), the New England Aquarium (NEAq) collaborated with Action for the Climate Emergency (ACE), The Wild Center, and three other informal science learning centers (ISLCs) to build consensus on thematic issues, practices, and strategies for supporting youth. The four-year project refined methods for incorporating civic engagement into ISLC youth programming, developed a toolkit of best practices, and convened meetings for teens and professionals to bring this content into the field.

The project anticipated scale up in the final years, but a combination of pandemic-related staff furloughs, curtailed operations, and lost connections with teens made this difficult to achieve. The evaluation aimed to understand the extent to which the project built a supportive network of ISLC educators, yielded professional practices to support youth civic engagement, and incorporated these practices into youth programming.

Despite setbacks, the team achieved each of these three goals. Although the size of the community of practice (CoP) was smaller than initially anticipated, its members generated consensus on general themes important to contemporary youth, and on the structures of effective programming. Although they achieved their goals, they did not achieve the scale they hoped, due to the pandemic. Nearly half of the CoP leads joined the program in its last year. Despite transitions in leadership and staffing, the group anticipates continuing to grow a socially-engaged, civic-minded community. They recognize that youth culture is shifting rapidly, and places high concern on equity, intersectional identities, justice, and collaborative action. They intend to continue to work together to refine strategies that can support this new youth culture as it engages in science and social issues.

Introduction

The **Capacity-building for Youth Civic Leadership for Issues in Science and Society** (CYCLIST) project builds a national community of educators from informal science learning centers (ISLCs) to support teenage youth in developing civic engagement skills to address issues at the intersection of science and society. The Institute of Museum and Library Sciences (IMLS)-funded three-year long project led by the New England Aquarium (NEAq) brings together Action for the Climate Emergency (ACE), the Audubon Nature Institute, Mote Marine Laboratory & Aquarium, Saint Louis Zoo, Woodland Park Zoo, and the Wild Center. The project received a no cost extension for a fourth year.

CYCLIST's three main goals are as follows:

- Build supportive social networks of ISLC educators around shared goals;
- Improve professional practices to support youth civic engagement as a new standard component of programs at various institutions;
- Devise ways to incorporate civic engagement into youth programs.

Project Overview

Summary of Year 1

At the start of the project, Knology conducted a literature review to help the project team better understand the landscape of research around youth leadership, and its intersection with environmental education and informal science learning centers (ISLCs) (Glasser, Gupta, Thomas, & LaMarca, 2019). After this, we sought to evaluate the development of a Community of Practice (CoP) among the consortium of seven ISLC's that comprise CYCLIST. At the end of Year 1, our assessment revealed that a CoP was developing, and that experiences and interactions offering both *Immediate value* and *Potential value* were beginning to emerge. We also observed members building knowledge capital—that is, tangible and nontangible assets such as skills, ideas, connections, resources / tools, and confidence. These different types of value demonstrated forward movement towards actualizing CYCLIST goals. Based on focus group data, we also identified three important themes that were indicative of the project's preliminary outcomes: professional development, positive youth development, and programmatic development (LaMarca, Gupta, Glasser, & Ardalan, 2019). Additionally, we saw evidence of an emerging CoP amongst the leadership team, and found that this appeared to be even stronger than the CoP for the participating ISLCs. Leadership team members described exciting changes in their organizational cultures around youth activism and civic engagement within ISLCs. They were keen to keep the momentum sustained as the project moved forward and felt that their work was advancing their organizations' missions (LaMarca, Gupta, Glasser, & Ardalan, 2019).

Summary of Year 2

The second year of the project built on relationships within and between institutions to develop a CoP to support professionals working with youth. Although the far-reaching impacts of COVID-19 presented significant barriers to the team's work (along with that of

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their institutions and audiences), the pandemic also allowed them to think creatively about building internal capacity, shifting priorities, and engaging with youth to build civic leadership skills and participation in action through in-person and online programming.

The evaluation, which included a discussion with the leadership team and a survey of project partners, found that throughout the second year of the project, some staff continued engaging with their students through virtual means, and provided space for them to discuss the pandemic and the national racial reckoning (Gupta, LaMarca, Nock, & Flinner, 2021). Project partners also shared several challenges in their professional lives and organizations because of the year's events, but were hopeful that the social movements of 2020 could lead to positive change in their institutions. Specifically, they hoped to see changes in their institutions' approaches to social and climate justice work, and to stimulate more conversations about equity.

Summary of Year 3

In Year 3, the pandemic continued to constrain the work of ISLCs (Gupta, LaMarca, Attaway, Thomas, & Fraser, 2021). Though able to reach youth through virtual programming, a combination of COVID-related staffing changes and transitions impacted all participating groups. It would take some time for ISLCs to rebuild their youth programming and replace the institutional knowledge they had lost. Participants worked to share what they had learned through the process with other ISLCs. To achieve this goal, they began developing a toolkit of best practices for incorporating civic engagement into ISLC youth programming. Dissemination of this toolkit was intended to help ISLCs across the country support youth civic engagement and develop equitable, youth-driven programs. The completed toolkit was planned to be hosted on the New England Aquarium website and made freely available to other institutions. As Year 3 drew to a close, the project received approval for a no-cost extension to complete the work as planned.

Context for Year 4

The CYCLIST project received a no-cost extension from IMLS to draw out the project for an additional year. The project leadership team decided to spend the fourth year focusing on the finalization of the toolkit, and dissemination of the team's learnings through various events. CYCLIST Year 4 events included the following:

- Connecting Youth, Science and Community Action: Building Capacity for Change – an Adult Professional Development Workshop which took place virtually on June 29th, 2022.
- A Virtual Youth Summit - which took place September 10th, 2022
- The CYCLIST in-person Symposium with the project team – which took place in the Adirondacks between September 19th-23rd, 2022.

Methods

Adult Professional Development Workshop

The evaluation team attended the Adult Professional Development Workshop as observers. Knology developed two surveys for the event:

- an **immediate post-workshop survey** which asked participants to reflect on the training they received, and share impressions about their expected use of the toolkit, and
- a **delayed post-workshop survey** which was distributed approximately 8 weeks after the event to assess the toolkit's use and its contributions to ISLC staff skill development.

The CYCLIST leadership team distributed both surveys to all registered attendees. We received only one response to the immediate post workshop survey, and zero responses to the delayed post workshop survey.

We report on the one response, with the caveat that this feedback is not generalizable. Primarily, we relied on observations of participants in the program, with a focus on the Q&A session to draw inferences about the potential value of the program beyond those involved in the project development.

Youth Climate Action Summit

The evaluation team assessed the impacts of the Youth Climate Action Summit through **a pre-program registration survey**. Evaluation questions were included in the participant registration portal, and was designed to provide a better understanding of youth participants' goals and needs—along with the exemplars they draw on in their current action efforts. Knology also developed **a post-participation survey** to assess attendees' learning impacts, which was deployed by event organizers immediately after the summit.

Registration Questions

Knology embedded the following questions into the registration form for the event:

1. What skills are you hoping to strengthen to succeed as a youth leader?
2. What do you need in order to better engage in community focused action?
3. Do you feel you have role models that represent how youth leaders can engage in community action? Please describe.

We received responses from 105 individuals. Responses included identifying information, to ensure all participants were known in advance, and to protect the Zoom session from external interlopers with mal-intent. Zipcode and state information helped to confirm which participants could be attributed to a partner institution, and those who became aware of the link through the social media used to promote the survey.

Post-Participation Survey

Of the 74 participants who attended the live program, six responded to the survey invitation. Therefore, the results of the survey are considered qualitative indicators of outcomes but cannot be used to generalize impacts. We draw on those survey results in the findings but rely primarily on the observations of the program and the registration data.

CYCLIST Symposium

In September 2022, the CYCLIST project team gathered in person in Lake Placid, New York. Attendees included the leadership team (which includes members from The Wild Center, New England Aquarium, and Action for the Climate Emergency), a staff member from The Wild Center, a staff member from the New England Aquarium, and three representatives each representing a participating institution (Saint Louis Zoo, Mote Marine Laboratory and Aquarium, and Woodland Park Zoo). A member of the Woodland Park Zoo staff who was contracted to provide facilitation support also attended the final symposium.

One member of the evaluation team joined the three-day meeting to observe discussions, reflections, and action planning. As part of the symposium, the evaluator convened two separate reflective discussions, the first with the leadership institutions, and the second with the participating institutions.

Leadership Discussion and Project Partner Discussion

Both reflective discussions employed a semi-structured discussion protocol based on the initial grant goals, while also allowing for reflections on the pandemic, recent racial and civic conflicts, economic crises, and the impact of the temporary suspension of activities on participating institutions.

Both reflective discussion instruments were approached as a guide to dialogue. They focused on the program plan, the challenges and adaptations that were required as a result of the global pandemic, and the consequences of that shift in direction for the four themes outlined in the initial grant narrative:

- Impact on Institutions,
- Impact on Youth;
- Impact on Professional Development;
- Impact on Community of Practice.

We present our results based on these four themes, drawing on data from observations and feedback, and noting that the limited response to our surveys diminishes the extent to which we could attribute results to the communities who participated in the events.

Results

Impact on Institutions

A Climate of Optimism

During the program's first year, access to the CoP and its resources gave members of the project team confidence to push the envelope at their own organizations. They relayed that much had changed regarding their organizational culture, especially regarding normalizing youth activism and civic engagement within ISLCs. Specifically, civic engagement work enabled staff to support youth participation in climate strikes. It helped to make staff more comfortable with supporting opportunities for engagement and agendas that they were perhaps hesitant to get behind previously because of their institutions' culture. This gave rise to optimism that these efforts would expand their organizations' capacities for youth engagement, or as one team member said, *"push [them] to a greater tipping point."*

The Pandemic Strikes, Equity Demands Grow

In Year 2, the Covid-19 pandemic imposed a severe shock on institutions. Staffing and budget cuts were the biggest impact, after initial closures to the public. This involved layoffs, reductions in staff capacity (especially in education departments), and reduced hours for remaining staff. A couple of respondents described how remaining staff had to shift their work priorities to other pressing concerns, including supporting operations. However, there were significant differences between the severity of the impact between institutions. Some were forced to cut core and/or seasonal staff, while a few were able to weather the storm with minimal cuts. In many cases, institutional capacity was redirected towards the time-intensive project of creating and maintaining virtual content, which was critical to engaging with the public and fulfilling their missions.

The same period saw the emergence of nation-wide protests demanding an end to systemic racism. Institutions generated statements of support for this larger cause and were compelled to examine how they could do better within their own organizations and activities—both in terms of Diversity, Equity, and Inclusion and in terms of climate justice. The emergence of these topics as high-level leadership priorities prompted internal dialogues with employees, as well as with Black and other minority communities. Some leadership team members saw these conversations as long overdue, while other institutions were able to continue to build on existing work.

Rebuilding Amidst Uncertainty

CYCLIST program staff in Year 3 continued to feel the effects of the COVID-19 pandemic. In some cases, staff at their institutions had left, taking valuable institutional knowledge—some gained through the CoP—with them. In multiple institutions, the program staff who had initially participated in the CoP had either planned to leave or had been laid-off from their positions. Overall, although educators were unsure of the exact shape of future youth programming, they viewed civic engagement as a valuable component.

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As a result, several institutions were planning to rework and re-launch youth programs which had shut down. As an indication of how the seismic events of the previous year had improved their awareness of racial inequality, a higher priority was to make participation possible for a more diverse youth population. They hoped to strategize about ways to overcome barriers to engagement for BIPOC youth—for example, by offering youth programming in the community, and allowing some youth to participate virtually rather than in-person.

While these changes are not directly attributable to CYCLIST participation, the discussions around equity and climate justice that took place in the CoP may have supported staff in planning modifications to their programs. Overall, educators felt that their participation in CYCLIST and their work on the toolkit helped these CoP members determine what they would require from their institutional administration and strategies they might need to use to secure approval to implement changes in their youth-driven programming.

Meeting Objectives

The results of our conversations with those who participated in the Youth Climate Action Summit indicate that CYCLIST had a positive impact on institutional youth engagement efforts in its last year. Finding that the summit was "*awesome*," one educator celebrated the way this event helped expose students to "*voices that aren't readily right there in our community*." Indicating that they would play recordings from the summit to promote classroom discussions, this participant believed that meetings like this could help schools provide students with concrete tools for climate action.

Sharing the Work

On June 29th, 2022, the team convened 30 practitioners from across the nation to share their work to date. The program began with an overview of civic engagement by Dr. Kei Kawashima-Ginsberg, who explored the broad scholarly definition of how one recognizes civic engagement. This was followed by a presentation of the toolkit, two rounds of facilitated focus groups, and a question-and-answer session with panelists. The event (which lasted for almost two hours) was recorded and posted on YouTube. At the time of this report's writing, it been viewed 35 times.

We received one survey response to the immediate post workshop survey. The single survey respondent reported that they found the workshop extremely valuable. They described being exposed to many resources and professionals working on youth civic engagement that they were not aware of before. They most enjoyed hearing directly from young people about how they felt empowered when given the opportunity to take initiative and assume leadership roles. They found the toolkit a very valuable resource—one they planned to use both for learning more about best practices for civic engagement programming and when implementing that programming at their own institution. This survey response corresponds to the goals of the event and the CYCLIST project overall, but is inadequate to make any claims beyond one participant.

Impact on Youth

Focus on Youth Empowerment

Participants were passionate right from the start of Year 1 about helping youth develop the skills they need to become proactive members of society. Participants also emphasized creating youth-led programs, and were excited to connect with like-minded individuals to discuss the challenges they face when designing and implementing youth programs. They noted the importance of helping students develop self-efficacy, take responsibility for their own education, and become their own advocates, and drew attention to the range of skills (including team work, public speaking, problem solving, and communication) that could facilitate each of these goals. All ISLCs hoped to address three challenges related to positive youth development through CYCLIST: reengaging students who had become disinterested, implementing adult-student listening strategies to support a youth-led program model, and designing programs that cater to students who may particularly benefit from group work.

Rewriting Priorities

Youth programming and participation in Year Two was impacted in a range of ways—most notably, the Covid-19 pandemic and protests against systemic racism. As a result of Covid-19, youth opportunities for in-person engagement (e.g., camps, interpretation, onsite volunteering) were no longer possible and had not resumed at the time of the survey (Fall 2020). However, some programs were able to keep youth engaged through online platforms on a regular basis (e.g., Zoom), and transition their programs to a virtual format. The most challenging aspect of this new mode of connection was to forge personal relationships (with students and teachers) through a virtual format, leading some staff and leadership team members to wonder if they were generating the same kind of impact as in-person activities.

Online engagement provided a vital channel to engage with youth who had been deeply affected overall by protests around calls to end systemic racism. Respondents described ways they were able to connect with youth during this time through open discussion during meetings about racial justice protests, systemic racism, and privilege. They noted how meaningful it was to hear from teens holding different racial and gender identities. These meetings also included check-ins, which allowed leadership team members to ensure that teens were safe. In some cases, respondents were able to use the same civic engagement tools that the ISLCs had provided them for environmental justice. On account of their overlap with racial justice concerns, these proved useful in tackling systemic racism.

Youth Empowerment Pays Off

Despite the disruption caused by the pandemic, youth at many participating ISLCs in Year 3 built leadership skills and participated in advocacy work. In most programs, youth worked in groups to design and carry out a project in the community. Projects covered a wide range of topics, from climate justice to sustainable foods to conservation of native species. Youth created content via various formats (including social media, podcasts, video, and printed guides) and shared them with audiences at the ISLC and beyond.

Educators saw the success of these projects as due in part to the ways they facilitated youth leadership. A common theme in interviews was the importance of providing scaffolding and

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support, but not making decisions for youth. Creating opportunities for youth to take on leadership roles was one of the goals CYCLIST members identified in Year 1 of the project. ISLCs were still able to create these opportunities even as programs changed in response to the pandemic. Taking charge of projects also provided opportunities for youth to build and practice professional skills—including time management, written and verbal communication, and working as part of a team.

Final Results

At the conclusion of the project, the majority of project partners were still rebuilding their programs after two and a half years of limited programming. Most reported that participation was down by more than half compared to pre-pandemic levels. Furthermore, the leadership team and remaining program partners reported that their programs were operating with substantially less staff and support than prior years.

The culmination of the program was a pilot national summit that brought together inspirational youth climate leaders from across the country. In addition to modeling strategies for youth action, these leaders created opportunities for youth to connect with one another, and to build action strategies informed by an understanding of the challenges and conditions in those areas where youth seek to make change.

Registration Questions

Of the 105 people who registered for the youth summit, 68 were drawn from the service areas of the leadership and partner teams. 38 were from other states, while 5 hailed from outside North America (including one from the UK, one from Moldova, one from Singapore, and 2 from Uganda). In total, 74 attended the final program.

Thirty-nine of the registrants were interested in gaining *communications skills* to help them lead programming (n = 39). Most of those youth were also drawn from the states where leadership and partners were based. Those registering from other states sought to *learn more about climate science or climate knowledge* (n = 15), while 24 wanted guidelines for *taking action* (n = 9) or *leadership training* (n = 15). Three mentioned that they wanted to *network with other youth*.

Table 1 lists registrants' geographical origin. Five of the non-partner registrants were adults seeking a model for their own youth programming.

Table 1.. Distribution of youth registrants.

Location	*n*
New York	26*
Missouri	14*
Washington	12*
Florida	10*
Pennsylvania	10
Massachusetts	6
Illinois	3
Indiana	3
Michigan	3
Virginia	3
California	2
Connecticut	2
Arizona	1
New Hampshire	1
New Jersey	1
North Carolina	1
Tennessee	1
International	5

* CoP member state

Table 2 lists the various role models that motivated registrants' participation in the event. Of the eighty-one registrants who claimed a role model, 14 named international celebrities taking climate action (like Greta Thunberg), while 26 named members of their own peer group.

Table 2. Role models in the lives of registered youth.

Location	*n*
Peers	26
Adults	25
No peers	23
Celebrities	14

Post-Event Survey Data

As noted, we received six responses to the post participation survey. In this survey, youth were asked to describe their primary reason for attending the summit. Most talked about their desire to be a part of the climate change movement. They wanted to hear from others doing climate leadership work, learn more about the science of climate change, and learn how to get involved in helping the planet.

Table 3 provides a sense of how participants felt about the summit. The six respondents who answered these questions all rated the summit as extremely inspiring. When asked how important, motivating, and connecting the summit was, a majority of respondents chose the "extremely" option.

Table 3. Rating the youth action climate summit on a five-point scale.

	Not at all	Slightly	Somewhat	Moderately	Extremely
Inspiring	-	-	-	-	6
Motivating	-	-	-	2	4
Useful	-	-	-	3	3
Relevant	-	-	-	3	3
Connecting	-	1	-	1	4
Important				1	5
Valuable				4	2

Four of the six responses said that they connected with other youth during the summit, however they were not sure if they would stay connected with them. Most survey respondents stopped responding to the survey after this set of questions.

The remainder of the survey included specific questions about the individual components of the virtual summit. Three individuals continued taking the survey and provided responses to some of the questions. Overall, attendees valued hearing about speakers' *personal experiences*, their different perspectives on *diversity*, and *the many forms that climate change action can come in*. From their participation in the summit workshops, two participants left feeling more motivated to be a climate leader in their community.

Our reflective discussions with CoP program staff echoed many of the same themes. Those we interviewed during the final convening of the CoP remarked on how the teen summit helped many youth "*find their passion*." Through peer interactions, many were also able to identify the skills needed to fully participate in climate action efforts, and to discover hidden talents useful for civic engagement in a broader sense. The summit itself provided many tools for civic activism, and allowed youth to better understand the intersections between racial equity, diversity, and environmental justice.

The post-program youth survey cannot be used to generalize the experiences of other attendees. Anecdotally, CoP members reported that many of the teenagers who participated in the virtual program found that this aligned with their own values and goals. When pressed on the nature of the presenters and how they framed concepts of justice, most CoP members affirmed that they saw no evidence of content that was novel or regionally valanced in ways that would not work for youth in their service districts.

Impact on Professional Work

Identifying Aspirations

When asked about current skills and knowledge during Year 1, program staff indicated that they had a range of experiences and training. Individually, most had substantial experience in facilitating youth programs, but few had knowledge of or experience in incorporating civic engagement into youth programs—including how to conceptualize civic engagement for themselves and for youth. Intentions for professional development clustered in two areas; (1) Relationship Building and (2) Specific Skills. The latter could be further subdivided between general civic leadership skills (including public speaking, grant-writing, and evaluation capacity building) and knowledge specific to youth advocacy and leadership training.

Reorienting in a Time of Crisis

The pandemic forced most programs to adapt by switching from in-person to virtual formats. In some cases, this required creating video content. In others, it meant assembling resources to support teachers and students, and/or directly engaging through platforms like Zoom. The level of difficulty carrying out these adjustments in many cases depended on institutional circumstances.

The protests in this period required serious engagement with issues of diversity and equity, which in turn meant recognizing the need for staff training despite the difficulties in existing budgets covering such unplanned costs. Respondents also offered related training in subjects such as climate justice.

Leadership Skills Return to the Forefront

The leadership team stated that the CYCLIST CoP had a major impact on members' professional development. The CoP's decentralized model positioned ISLC staff as both leaders and learners, giving them an opportunity to build professional capacity (both in program development and community development) and to familiarize themselves with civic engagement and theories of change.

CYCLIST project members gained professional skills that are applicable in a broad range of contexts. Educators said that they developed communication and collaboration skills from working with a diverse group of people from around the country, and that they built networking capacity. Hearing other participants talk about the programs at their institutions helped each educator think more deeply about their own work. Participants also said that implementing new strategies and activities into their own programs helped them build their capacity as educators.

Evidence from the reflective discussions we conducted at the Symposium similarly indicates that the CoP furthered program participants' professional development. Being around a group of likeminded people who were similarly excited to launch youth-oriented climate change programs gave participants newfound confidence and enthusiasm, encouraging them to "*try new things*" and reach out to colleagues in the hopes of generating new

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conversations and new partnerships. As one participant put it, the event showed how joining a CoP could be "*really beneficial to…my career*."

In our conversations with those who participated in the Youth Climate Action Summit, we received direct confirmation of many of these points. Through their participation in the CYCLIST CoP, members were exposed to a diverse variety of viewpoints, and became familiar with a wide array of organizing techniques and strategies. This helped them understand that the climate change movement is not a single thing, but instead, a multiplicity of movements—each working in different ways to advance climate justice. The CoP was seen as a forum for having "*great conversations*," and for experimenting with both time-tested and new models of civic engagement. Speaking to the summit's impact, one member explained that different people can be climate activists "*in their own away*"—each drawing upon their own strengths and skills.

In addition to this, comments we received from an education professional who joined the project during the no-cost extension year indicated that the CoP was an eye-opening learning opportunity. Participation in this was rewarding in both a personal and professional sense, and left this individual with a newfound sense of responsibility for bringing new practices into their organization.

Through reflective discussions, we also saw that CoP members were surprised at how powerful and transformative educational summits could be. Noting a need for similar kinds of collaboration in the informal sector, one member recommended that all institutions send teams to these events, as doing so would help facilitate connections and make the CoP more durable. This led to conversations about how to create institutional teams, and about how these teams might create plans, spaces, and models for youth that provide year-round opportunities for care and practice.

Impact on Community of Practice

A Strong Beginning

Participants in Year 1 looked forward to having a group of people they could contact to talk about daily challenges and successes, and were enthusiastic about gaining a network of support. As one participant put it, *"having that community is a way to not reinvent the wheel as often, if we have people to reach out to."*

Participants felt that their participation in CYCLIST validated their work and provided them with a clear message for their communities. They also felt that as the project and CoP developed, they would be able to focus on providing more opportunities for their youth and their communities. These results suggested that participants gained immediate and potential value from this CoP.

Crisis and Reorientation

The pandemic strained home institutions across the country, and in Year 2, this proved to have cascading effects on the CoP. As a result, it became difficult for members to sustain this. Confronted with more work and less time to complete it, their capacity to engage in regular CoP meetings was limited. It was evident that they were deeply concerned about the

future of the CoP—and in particular, about losing the momentum they had built to create real change.

Leadership team members also described the emotional nature of how the CYCLIST CoP had been affected. It was difficult for members to hear from colleagues about loss of staff and leadership, including team members who were part of the CYCLIST CoP. They were unsure about connecting with members who had been laid off again, and about what institutional recovery would look like. They were also concerned about how to navigate connections in a virtual world. The pandemic's emotional toll extended beyond the CoP.

During this difficult time, the CoP became a platform for engagement and conversation—one that allowed members to share resources and to discuss ways of supporting the Black Lives Matter (BLM) movement. Leadership team members described how resource sharing to advance racial equity increased significantly during the summer of Year 2. The CYCLIST CoP was a vehicle for bringing equity to the center of climate-related programming. Leadership team members were able to integrate responses to racial inequity and climate change, while also gaining the ability to honestly assess their organizations' performance in these areas.

Recovering the Community of Practice

Participants in Year 3 spoke very positively about their participation in the CoP, especially about the two in-person meetings. These were preferred over virtual communication because they provided sufficient time to delve deeply into topics, and allowed members to become acquainted with each other's expertise and background.

CoP members reported that they valued the diversity of perspectives present in the group. Participating ISLCs were located across the US and operated under very different constraints. They included zoos, aquariums, and museums with different missions and areas of expertise, as well as Action for the Climate Emergency (ACE), an advocacy organization. In interviews, educators explained how seeing what other members were doing prompted them to think about how they might implement similar strategies. Some noted that outside of CYCLIST, they had limited opportunities to speak with ISLC professionals operating beyond their home institutions. The CoP provided a much-needed space for participants otherwise isolated in institutional silos to share their perspectives and ideas with a wider community of like-minded people. The educators identified this as the most impactful aspect of the CYCLIST model. For their part, members of the leadership team said that they were highly interested in participating in similar communities in the future.

Leadership team members said that being together through the crisis deepened their relationships, increased trust between members, and allowed them to have "*harder conversations*." This included discussions about calls for racial justice, how to better support DEAI, and about climate justice. Compared to educators from partner institutions, it appeared that the leadership team had a clearer understanding of those aspects of the CYCLIST model focused on learning and professional development.

Sustaining the Community of Practice

Year 4 of the project coincided with a gradual return to live programs and in-person youth engagement for all participants. Despite this, the program concluded with only five participating institutions (and ACE), as the Audubon Nature Institute was unable (owing to budget constraints that coincided with the no-cost extension year) to continue its participation in CYCLIST. Nevertheless, those remaining considered the Audubon Nature Institute to be members of the CoP.

Much of the leadership team's reflection on the four-year grant funding confirmed that despite substantial changes due to staff transitions and budget constraints, the CoP remained vital, and succeeded in adhering to what had been envisioned at the start of the project. They uniformly agreed that their leadership group provided an essential scaffold for their work, and for the emotional stresses they experienced navigating the pandemic and retaining connections with youth in their communities.

Leaders felt CoP meetings helped promote individual wellbeing, and supported fidelity to the original grant proposal. They attributed pandemic upheavals, staff loss, budget cuts, and transition to virtual programming with preventing them from reaching their goals for scale. The founding group was able to manage staff transitions at partner organizations, and refined protocols for welcoming new team members as those organizations changed staff. The final group claimed that the CoP structure helped them build strong relationships, compare professional similarities, and compare cultural differences, despite the transitions they all had to deal with. They described the professional network as a helpful environment that encouraged learning, and left them feeling they were part of a supportive and strong community.

Leaders observed that the project steadily acquired more momentum and visibility within their other professional networks as the project matured. Whereas presentations about the work at affiliated conferences held during Year 1 produced relatively small audiences, by the final year of the project, CYCLIST conferences were regularly drawing attention from dozens of institutions. Those who attended these events were particularly excited about the toolkit, and believed that discussions about its use would lead to future grants, longitudinal work with other institutions, and new ideas about how to promote and showcase work on youth engagement and climate action.

Project Legacy – The CYCLIST Toolkit

With the emergence of the global pandemic, the leadership team determined that they would need to develop a toolkit, one that would help build ISLC capacity around youth in civic engagement for those informal science educators whose programs were suspended. The plan was to continue to support the CoP and build the toolkit as a shared reflection of their knowledge. Doing this would lay the groundwork for a set of resources that could be easily deployed when museums returned to public programs.

One of the organizations aimed to increase digital content to more creatively focus on partnership building, leadership, and support for high school youth. Another leader described how refocusing their project work presented opportunities to focus on the toolkit,

including refining efforts to incorporate civic leadership into programs while being responsive to youth's experiences of COVID-19 and ongoing racial reckonings. An example was provided of one CoP focusing on empathy and social justice, which could be part of the different resources and expertise that different institutions contributed.

These plans advanced slowly during Year 3. As one educator put it, ISLCs would be able to move from "*making programs for youth, assuming we know what they want [to] a program driven by the youth*." CYCLIST team members also mentioned the value of the toolkit's information on barriers to implementing a successful youth program. They suggested talking points that educators could use in discussions with administration to gain support and funding for youth-driven programming and civic engagement. They also noted that helping ISLC staff understand the organizational capacity needed to run a successful program and how others have navigated obstacles will help them plan realistically. Plans were also made for toolkit dissemination to the larger ISLC community through the New England Aquarium's website to facilitate the replication of equitable, youth-driven programs.

By the end of Year 3, with the pandemic receding but still militating against live programming and youth engagement, most of the partners recognized that the resources and time needed to complete the toolkit would exceed the reduced internal capacity of their respective institutions. Consequently, a no-cost extension provided the time to develop a toolkit that they felt reflected all perspectives of their group. As part of the final grant-funded meeting, one member of the group proposed a new set of thought-lines to expand beyond the toolkit's initial six categories:

- field experiences
- social connections
- placed-based components
- project-based learning
- youth-driven programs
- youth-led focus
- core memory
- experiential learning
- opportunities for making a difference
- sharing your authentic self

At the conclusion of the final CoP meeting, members reflected on the positive feedback they received from colleagues, and their experiences with the national virtual teen summit and final toolkit. They felt the toolkit reflected the values of the youth that are part of their programs, and agreed that this important legacy of their work would benefit others in museum practice.

Discussion

Redefining the Mission

During the first year of the CYCLIST project, we saw a cadre of interested and motivated educators across different types of ISLCs seeking to enhance the youth-focused programming at their institutions. The language to describe the program's chief focus was a topic of much discussion throughout the year. The original framing of the project goals to enhance youth "civic leadership" was reframed to be youth "civic engagement," in favor of the latter term's wider focus. Although this term resonated with participating ISLCs, the specific ways it would be conceptualized was murky in the first year. At the end of Year 1, we saw the leadership team reflect movement towards focusing on skills such as confidence and efficacy for youth to be more strongly involved in advocacy efforts.

The 2020 protests that erupted over entrenched systemic racism led to an expanded emphasis on BIPOC youth engagement and climate justice as key to content messaging and dissemination. CoP members recognized that the youth in their programs would provide input to help prioritize racial equity. They felt these youth had a sophisticated understanding of the inequitable engagement of communities of color in environmental work, and could therefore help make racially marginalized voices critical to the cultural shifts they sought.

The shift to online interactions offered new ways to engage youth audiences in virtual formats, which in turn facilitated these digital natives' leadership in organizing climate and environmentally-focused events at individual institutions. The results of this approach were visible in Year 3, which spawned a wide array of projects whose content ranged from print to video and social media.

The Struggle to Maintain Community

Four themes united the Community of Practice in Year 1: to reframe their youth programming in terms of youth development; to validate and contextualize their institutions' existing youth programming within best practices identified in the research literature; to enhance their professional skills to lead youth programs; and lastly, to be part of a community of educators who supported the collective advancement of these goals. The community was integral to the exchange of learning, resources, and experiences, around a shared focus area relevant to members' professional and personal lives.

The second year of the CYCLIST project coincided with the global coronavirus pandemic and the nationwide racial reckoning across the US, which traumatically impacted the work of the community of practice. But despite the reduced hours, reprioritized work focus, budget cuts to programs, and the loss of colleagues, the group demonstrated resilience and adapted to this new reality, supporting their institutions as best possible.

The emotional toll from the pandemic and the calls for racial justice were evident on multiple levels. Despite existing barriers, there was a deep desire for support from the CYCLIST community to have the opportunity to share and learn from each other during this difficult time, while acknowledging their institutional and personal circumstances. As racial

equity came to the forefront of their work, they were additionally concerned about the support they needed to help their youth audiences—especially those of color—as they navigated their personal lives within an inequitable society.

The community's resilience as it entered Year 3 was a testament to the value of the social-emotional support the CoP provided to individuals as well as the collective. The CoP focused increasingly on using what it had collectively learned to create a lasting legacy.

The Commitment to Legacy

During Year Two, the CoP's shared commitment to developing a toolkit for informal science educators invigorated joint work and provided new opportunities for everyone to contribute meaningfully. Despite the distinct approaches of each institution, their CYCLIST experiences have yielded a universal, strong focus on elevating and prioritizing youth voices. For educators, the enhanced appreciation of youth as active participants in shaping their environmental programming, was most salient. As a result, these are the lessons conveyed in the toolkit, which members hope will be valuable for other youth-focused informal institutions and educators.

The potential for the toolkit to highlight youth perspectives and action on environmental issues meant that it could be a vehicle to emphasize a more just, equitable future for the environmental movement. We anticipate its value in highlighting the multiple approaches inherent in environmental education (e.g., Fraser, Gupta, & Krasny, 2014), actively engaging BIPOC voices in the professional field (Gupta, Fraser, Shane-Simpson, Danoff-Burg, & Ardalan, 2019), and providing collaborative opportunities for educators with distinct worldviews (Gupta, Ardalan, & Fraser, 2017).

Outcomes for Museum Practice

The toolkit has great potential for highlighting youth perspectives and action on environmental issues. In addition to contributing to a more just, equitable future for the environmental movement, the toolkit could also be used as a model for other contentious issues with scientific data at their heart. We anticipate its value in highlighting the multiple approaches that are part of the environmental education movement (e.g., Fraser, Gupta, & Krasny, 2015), in actively engaging BIPOC voices in the professional field (Gupta, Fraser, Shane-Simpson, Danoff-Burg, & Ardalan, 2019), and in providing collaborative opportunities for educators with distinct worldviews (Gupta, Ardalan, & Fraser, 2017).

We note that each CoP member is part of a variety of other communities of practice, including the larger ACE community (which collaborates with formal educators), the Association of Zoos and Aquariums, the National Network for Ocean and Climate Change Interpretation, the Association of Zoos and Aquariums Conservation Education Committee, the North American Association for Environmental Education, Climate Literacy and Energy Awareness Network, and various other groups that intersect with youth. While still a nascent community, the CoP has several champions who are well-placed within their institutions. As such, it is well-positioned to grow in alignment with the original principles that were imagined before the pandemic.

When the evaluators assessed the group norms, commitment to ongoing meetings, and their commitment to one another, it was clear that the CoP has the foundation to grow in coming years, and may have the durability required to welcome other institutions as they rebuild their programs.

Sharing Power to Advance STEM Literacies

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.

Introduction

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). The 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 collaboration.

As a result of the COVID-19 pandemic, a combination of furloughs, reprioritized work for remaining team members, and an overwhelming workload, CASL final activities were brought to a premature end in March 2020. Fortunately, team members were able to

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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 collaborative programming efforts, 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 local ecologies, 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 though 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 develop 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 reveal the complexity of human-nature dynamics, which are integral in understanding how to move forward with effective solutions that consider both the wellbeing of community members and the health of the earth. These fundamental connections and understandings are the **foundation for future change** and a 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 1.

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 helped support and nurture each organization's mission through the partnerships and resources it 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 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 people 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 contributed to their professional development. Due to limited capacity of aquarium staff, we were able to speak with 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 provided 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 felt deeply connected to Long Beach and different aspects of its diversity, how they relied on their neighbors, and how they brainstormed community challenges together. We saw these efforts as expanding the scale of connections so that people from different parts of the community could 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 measure 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 aquarium's educational resources.[1] 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, helped interviewees learn more about the intersectionality of local environmental and social issues, and about 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 that the event made them more prepared to confront visitors who were not wearing masks.

[1] 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.

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 community members. In East Boston, residents expressed 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 that they were able to rely on their neighbors and 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 aquariums to collaborate with community partners towards these possibilities.

Final Interviews

At least one staff member hoped that the moment of reflection afforded by the pandemic would lead to increased interest in learning more about 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 provided 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 explained how 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 explained how these 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 laid 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 thought they needed, 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 aquariums that face obstacles because of systems that make operations contingent on the number of people that come through the door and buy tickets.

We also heard that CASL gave aquariums opportunities to engage in new ways with different sectors that they did not typically work with. Primarily, staff members were committed to changing the way people think about aquariums, and seeing these centers as part of the community. As one staff member 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 brought diversity and inclusion in hiring and board representation to the forefront. The sites are said to have cared about this in the past, though now this is a much more important objective in order to best represent and support 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 observed that while inclusion and diversity had always been a part of their institution's mission, they were now more important and relevant than ever. They felt their institutions were committed to strengthening relationships and representations of the community. As one staff member said, "*We wouldn't be an aquarium without the community we serve."* Staff remain committed to rethinking the role of aquarium as 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 of the What's up Eastie radio show local to East Boston, focusing on science in relation to the sea, advancing science literacy through the radio 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 started to showcase the project during one show each month, where he interviewed residents and highlighted their community work, while sharing science content for listeners.

Supplementing these were 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 by a radio segment called "What's up Eastie?" An NEAq survey of attendees (N = 70) 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 individually-focused activities (e.g., recycling and composting), 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 offered 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 staff members said they had learned something new about Chelsea Creek and would be interested in exploring the area more to observe animals there. Aspirations for their community involved more universally accessible outdoor events and opportunities for connecting with each other through family friendly events. 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 reached 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 (which was hosted in partnership with Khmer Girls in Action, Long Beach Forward, and Friends of Colorado Lagoon FCL) and a press release for the League of Women Voters (LOWV) Climate Change Symposium at AOP. At the Sharing our Stories event, Khmer Girls in Action (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 residents. Questions included what they loved most about Long Beach, changes they had seen within the community, 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 these notes were excerpted with photos, and translated, printed, and posted to showcase residents' perspectives on 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 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 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 found the content interesting. Most thought the content was extremely relevant to their work, and 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 definitions of 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 the webinar used to discuss challenging topics such as COVID-19 and systemic racism. Both participants we spoke to really liked the webinars, appreciated their formats, and hoped to see more of them. One suggested doing additional webinars that provided resources and encouraged 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 the partnership's continuation.

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 learned from these multiple societal crises, highlighting the promise and 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, & Ardalan, 2019). Although time-consuming, laborious, 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, which 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, at one of the case study sites, community members indicated an 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 drew further attention to additional risks that were perhaps invisible in these communities, that further exacerbated their economic conditions, and that 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

Over the life cycle of the project, it became increasingly clear that in order 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 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. 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.

Community Partnerships for Resilience

Over the life of the project, CPR moved toward the project's goals of developing a Community of Practice and empowering youth to have an impact in their community. In the third and final year of CPR, the project team continued to make progress until work was put on hold due to the COVID-19 pandemic. Nevertheless, the project offers a model for developing partnerships between cultural institutions and communities, and both CPR team members and educators are optimistic about adapting the project to a virtual environment. Throughout the past three years, relationships continued to form slowly among different groups (within and between municipalities) that did not exist before and will last post-project. Sharing resources and best practices among this network was invaluable. These partnerships lead to respectful, collaborative relationships that advanced youth-driven community climate work. The Public Education Programs (PEPs) implemented by CPR team members and educators helped build knowledge and awareness in youth and community members of the local environmental and social issues their communities face. Overall, CPR built a strong toolkit for educators to continue and grow this work with their students, and in turn their communities.

Introduction

In 2018 and 2019 evaluation results showed a steadily growing Community of Practice (CoP), as well as increased benefit to students and educators through capacity and skill development, increased climate literacy, and the creation of Public Education Projects (PEPs) to engage local communities. We also observed a growing concern for the changing climate in these communities and increasing opportunities for educators, students, and community members—in addition to CPR team members—to be engaged in CPR's public facing projects to increase their climate literacy both broadly and in relation to their local communities.

This report presents a summary of key findings from the first two years of the CPR project, and presents evaluation results from the final year while accounting for the impact of the COVID-19 pandemic on the project. The objective of this report is to describe the general outcomes of this initiative.

Snapshot of Years 1 & 2 Results

First Year

At the end of the first year of the CPR project in 2018, we saw a positive movement toward **developing a Community of Practice**, as well as **support for youth-led community efforts.** Even though much of the work focused on one of the municipalities (Lynn), we noted indicators of the early stages of a CoP. CPR team members made new relationships

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within their team and acknowledged that working together in new ways could strengthen the success of the project. While these changes didn't yet appear to impact their organizations' overall work, they did advance how CPR team members supported their work with youth.

Some CPR team members applied the lessons learned through the project to advance their community's youth's climate resilience efforts in Year 1. Educators in particular expressed the opinion that project team support would be essential for them to continue to guide their students in developing the PEPs to engage community members in creating solutions for a more resilient community. They hoped to focus on middle schoolers' efforts to align with communities' priorities.

Second Year

At the end of the second year**,** the CPR model progressed further, as CPR educators continued to engage youth in the three municipalities to build awareness of climate issues in their communities. As an extension of the Year 1 results, we again saw **progress in the Community of Practice** as seen through meetings and convenings that occurred to connect the groups. One municipality in particular developed this work. Additionally, **working on community focused action** became an accomplishment for educators who worked directly with students on developing community focused PEP projects. However, the process was challenging due to time constraints, the resources they had available for the work, and difficulty articulating the project model to students.

The communities that youth engaged with in Year 2 were deeply concerned about local environmental issues, suggesting they are a prime audience for the student PEPs. While students most frequently reported discussing environmental topics with their family and friends, they were less likely to engage in more civically oriented actions with potentially larger scale impacts (e.g., contacting government officials, voting). Additionally, students engaged in discussions about the causes and effects of climate change but were less likely to have discussions about environmental topics that are fairly complex (e.g., climate justice) and controversial (e.g., political debates). While we do not have specific data about the municipalities they represent, we know the community members who responded to the survey were typically associated with the students and likely to be part of the CPR communities.

Methods

The evaluation plans for the final year of the project had to be revised in response to program-level changes (including staff layoffs and furloughs) resulting from the COVID-19 pandemic. The goal was to ensure that the adapted methods were responsive to the changing project circumstances, while tracking the questions guiding the evaluation. To account for these changes, we adapted the process survey for CPR teams, and educator survey to assess skills and capacities for municipal partners, community partners, and educators. Additionally, we incorporated reflective questions into the teacher survey that

asked about their suggested revisions to the CPR curriculum and resources. Below we provide more detail about the methods we used in each study, and how they were adapted to account for changing circumstances.

Educator Survey

Since educators' responsibilities changed drastically over the last year, it was necessary to adapt this survey instrument to capture these changes. This survey asked teachers to report on how their educator role in CPR and their students' learning were impacted by the pandemic and by calls to end systemic racism, as well as their concerns about continuing the work in the future (Appendix A). They were also asked to reflect on the project as a whole over the past three years and share their overall experiences, including what they were proud of, what worked well, and what was challenging. Educators were also asked how the CPR project influenced their teaching related to both climate and non-climate related topics. They were also asked to report on their perceptions of impacts on students and communities.

In August 2020, shortly after the CPR Teacher Institute, New England Aquarium sent the survey to 30 teachers who were involved in the CPR project and used the CPR curriculum. The aquarium sent two reminders during the 3-week window that the survey was open. Knology received six survey responses from CPR team members. Four were from Lynn, one was from Hull, and one was from Chelsea.

A Knology researcher reviewed and organized all survey data into a framework guided by the research questions in order to identify themes and summaries across each question.

CPR Team Process Survey

Originally, the CPR Team Process Survey in Year 3 was intended to include similar questions as Years 1 and 2, in order to track the development of a community of practice among and within each of the three East Boston municipalities. The revised survey asked participants to reflect on the project as a whole, rather than just the previous year (Appendix B). They were asked to share what their overall experience was like, what value the CoP brought, and how their participation contributed to their work and the way they thought about community resilience. Additionally, the survey asked how recent events such as the pandemic and calls to end systemic racism affected their work in CPR.

The survey was shared with 17 people by New England Aquarium Survey in August 2020. This group included community partners, municipal partners, and school administrators. The aquarium sent reminders during the 3-week window that the survey was open. The response rate was low, likely due to limited capacity and changes to staffing across many institutions and organizations. We received responses from four out of the seventeen individuals. Two were from Lynn, one was from Hull, and one was from Chelsea.

A Knology researcher reviewed and organized all survey data into a framework based on the research questions in order to identify themes and summaries across each question.

Results

Results from the CPR team process survey and the CPR educator survey are integrated in the summary of results. Comparisons across the groups were not possible, due to the small sample sizes. Where differences appear between the two data sets, we describe each independently.

Impact of COVID-19

The impact of the pandemic was identified by all respondents when asked directly, and was mentioned in responses to almost every additional survey question. When asked how the pandemic affected their work in CPR, educators and CPR team members explained that the work essentially came to a halt. They acknowledged school closures, stay-at-home orders, and the psychological toll of the lockdown on everyone involved. Overall, work in the final year of the project was essentially cut short since program implementation with students was not possible. Additional impacts COVID-19 had on different aspects of the CPR project are described in the following sections.

Successful Partnerships

Relationship Building

Survey respondents on the CPR team agreed that collaboration and sharing of resources and ideas was the most valuable part of working with the larger CPR community. CPR team members appreciated sharing best practices and resources, while expanding their networks. However, they identified persistent challenges including a lack of momentum with consistent, timely, and effective communication, as well as limited time and competing priorities.

Educators highlighted the dedication of the CPR leadership team and indicated that they enjoyed working with all involved. They particularly appreciated the opportunity to provide feedback on additional support that would be useful to educators throughout the project.

Table 4. Table of CPR activities participated in by CPR team members over the course of the project (N=4).

CPR Activity	# of Survey Respondents
Local municipality meetings (with NEAq and MAPC)	3
Local municipality meetings (with Chelsea/Hull/Lynn CPR members only, not NEAq or MAPC)	3
Summer 2020 Teacher Institute	1
Engagement with educational partners	2
Other meetings/trainings/events (please describe) *	2

Note. "Other" included planning meetings with educators and student PEP related events.

Value of the Model

Collaboration across municipalities and with new organizations was highly valued by the CPR team, who shared that it opened opportunities and access to new resources and networks. Participating educators greatly valued the collaborative aspect of the project, and applauded the training aspect and the resources, though they noted difficulties at the start in student recruitment, attendance, and enthusiasm.

Educators felt proud to be a part of the CPR project through teaching, and for their students to understand their local impact on supporting resilience in their communities. They also saw how working collaboratively allowed them to better support their students in ways that led to positive community impacts. Educators also felt that supporting their students in this work was a rewarding experience.

Impact of COVID-19 on the Partnership Model

Though educators were not able to implement lessons once schools shut down, they reflected on how resources created for distance learning (as a result of the pandemic) could engage students more effectively in the CPR. Suggestions to maximize student engagement included virtual field trips and case studies on educational social media campaigns. One educator said that these suggestions could "*show the students that educating the public during a pandemic where everything is limited to virtual is still possible.*"

Educators also suggested they could independently finish their PEP projects with students virtually with remote and social-distance-friendly options in the curriculum. They spoke about the benefit of being able to access digital resources anywhere, which they found helpful. Overall, educators wanted to be able to continue CPR work by using the curriculum and developing PEPs with students through remote learning.

Post pandemic, CPR team members hope to move this work forward even after the end of the project by leveraging the relationships built and continuing to engage students in PEPs by using the existing curriculum and the network and connections that have come out of the project. One CPR Team member talked about hoping to fine-tune the curriculum to *"best suit the needs of the district and larger community and involve more students."*

Climate Resilience & Literacy

Knowledge & Awareness

Through learning about ways climate change impacted their community, students, members of the CPR team, and educators became more aware and knowledgeable about climate change on a broad level, as well as local impacts in their specific region of Massachusetts. In addition to increased levels of science literacy, educators reported that students also learned about the social and financial implications of sea level rise, such as flooding risks and costs of repairs.

CPR participation made educators more comfortable collaborating with other educators, and inviting outside expert voices for lessons. Educators also said they felt more prepared to facilitate group work in ways that prioritized student ownership and exploration. Additionally, educators said students' critical thinking and creative skills were fostered by offering the "*time and space to explore outside of class time.*"

Impact of COVID-19 on Climate Resilience & Literacy

Most educators shared that due to the pandemic, students were unable to complete their PEPs, which was disappointing to both students and educators. One educator shared that an unanticipated benefit of not being in the classroom was that it "*necessitated a lot of flexibility and required me to use multiple types of resources*" by encouraging them to try activities they would not have thought of under typical circumstances. Educators also said that they had "*very little head space*" to focus on CPR in the midst of the pandemic and remained concerned about students losing access to resources the school provides them—including academic experiences, health services, and social connections. One educator noted how the pandemic has *"elucidated inequitable access to educational materials and opportunities."*

In addition to the pandemic, the wave of protests to end systemic racism impacted the work of CPR team members. Two respondents talked about how recent events made them think more about environmental justice issues, and how they planned to incorporate more of those topics into their future work. By taking this approach, they hoped to build awareness of how climate change impacts different people and communities differently.

Some teachers echoed this idea, and hoped to incorporate more environmental justice content into future lessons, as well as being more aware and inclusive about the language that they use. Two teachers talked about hoping to see all educators support racial justice and resource sharing that supports goals relating to equity.

Successes & Challenges

Educators shared various successes and challenges regarding different aspects of the CPR program. In this section we address both what worked and what did not for educators.

Curriculum & Activities - Educators liked the curriculum videos and activities because they were well designed for middle schoolers and adaptable for English Language Learners. The only challenge, according to two educators, was having too many options to sift through that sometimes made it difficult to narrow down which resources to use.

Logistics & Scheduling - Planning well ahead of time was helpful for educators regarding things like scheduling field trips and expert or specialist talks. We heard that challenges in logistics and scheduling included having limited time, working around conflicting activities, and scheduling with people from outside the school.

Student Involvement & Engagement - Educators struggled with student engagement from the start, particularly in the afterschool program. However, educators agreed that momentum improved between the first and second year of the program after they gained more experience. They were able to establish relationships and lines of communication with project partners, and both educators and students had a better understanding of the goals of the project. Students seemed to appreciate having choice and freedom for their projects, which educators saw as positive even if this sometimes made it challenging for them to keep students focused. Overall, teachers observed that students' real-life experiences piqued their interest and kept them motivated.

Public Education Programs (PEPs) - PEPs seemed to function as an impactful way for students to have their voices heard, and educate the community on what they were learning about climate change. Similar to student engagement, PEPs were slow in Year 1 because of confusion about the programs' relationship to the project; we heard it would have been helpful to have more clarity and a better understanding of the PEP goals from the beginning. Fortunately, by Year 2, aspects like time management, recruitment, maintaining student engagement over the course of the year, and understanding the goals of the project were much easier to handle. In the final year, the intended PEPs could not be completed due to COVID-19.

Community Action

Working together to communicate with the public about the PEPs allowed students and community members to collaborate in *"a common effort to increase climate resilience*." CPR team members emphasized the importance of community engagement, and liked that CPR gave students the opportunity to be involved in the community. One CPR team member said, "*Students' interactions with community members was the most valuable component of the program."*

All respondents saw community involvement as critical to success in their work, and highlighted the value of student activism in building awareness. One educator shared that *"collecting stories from community members at a public event*" and the chance to "*interact with adults in discussing the issue of climate change*" allowed students to understand the importance of including various voices from the community in their activism. According to educators, learning more about climate science and the local issues facing them also increased students' understanding of community needs, and caused students to be more concerned for their communities. Watching students gain experience working with communities was a highlight for educators, who felt proud to help build relationships and knowledge around climate resilience in their area through student voices. As one educator put it, *"I am most proud of our students' confidence in their voice as community members and their investment in trying to improve climate change education for others."*

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Implications & Recommendations

Over the three years, the CPR project illuminated unique ways in which cultural institutions, (in this case, the New England Aquarium) can build partnerships to advance knowledge and community action to address local ecological challenges and increase resilience. We describe the implications of the CPR model in the following sections.

The Role of the Community of Practice in Climate Resilience Partnerships

A multi-faceted group of stakeholders representing voices from municipal partners, community organizations, and local schools collaborated with the Aquarium to move the project work forward. Across the years, we heard that this learning community successfully identified the shared interests among community stakeholders to address local environmental challenges. The co-learning helped teachers develop classroom activities that supported student leadership of community-facing projects. We saw progress across the first three stages in Wenger, Traynor and de Laat (2011)'s framework for developing a CoP, where the community appreciated the interactions among the CPR team (Immediate value) and engaged in resource sharing and knowledge building through the interactions (Potential value). The educators, especially, were able to apply their joint learning to advance their knowledge of local climate challenges and devise ways to use their curriculum to impart the lessons and skills to their students (Applied value). Despite the challenges experienced before and as a result of the pandemic, the emerging CoP demonstrated the value of the CPR model co-developed by the NEAq and its community partners. In particular, the case study of the municipality that appeared to be more active in the CoP may provide a useful guide for projects in the future.

The lessons learned will continue to be relevant in a virtual learning space while in-person activities are stalled, and likely even under safer conditions as an alternative way to engage and learn from each other. CPR Team members signaled the need to devote more attention to meeting the needs of community members with the help of students who were part of the communities.

Building Capacity among Educators & Students

The CPR model used formal educational tools and audiences to engage community members in addressing local environmental challenges. Educator capacity building was a central part of the eventual community-focused action that students led. Educators especially appreciated the opportunities the project afforded to co-develop the curriculum they wanted to use with their students and the flexibility in how it aligned with their specific students' needs. After the initial ambiguity about the purpose and goals of the PEPs, educators seemed to have embraced their role in actively learning from the CoP applying it in various ways. By enhancing their own knowledge about local climate-related challenges and their close connections to other social issues, they were better empowered to translate lessons into classroom activities.

At the end of the project, especially with the premature end to the curriculum development and implementation process, long-term recommendations aimed at helping educators leverage the virtual opportunities that emerged because of the pandemic. In these new circumstances, educators were also more attentive to the inequities in students' access to valuable online resources.

Unanimously, across the CPR teams, the student-driven component was considered the most impactful part of the project. The project expanded the group of change agents who could tackle critical environmental challenges and strengthen their communities. Educators were proud that students had become confident problem solvers capable of working closely with fellow residents to build knowledge and take action to become more climate resilient.

At the project's end, we were especially attentive to the institutional capacity within NEAq and future implications for additional iterations of the model. However, we have included recommendations to guide future work, as is realistically feasible for the Aquarium to continue to expand and support the model that CPR has built.

Recommendations

1. Expand upon the CPR strategies to facilitate engagement among future communities of practice, to develop their joint capacity advancing local climate resilience work. The lessons and approaches that helped the Lynn municipality may be especially beneficial to draw from to guide future work.
2. Invest more time and effort in the first year of the project to collaboratively determine the specific roles each project partner will play, and the responsibilities they will hold to advance relevant aspects of the project. We anticipate such processes will provide clarity on the expected project goals and the ways in which each partner would contribute to them.
3. Leverage the lessons learned in the context of the pandemic, especially for teacher capacity building and student engagement, to expand the CPR model in a virtual format. We anticipate this will highlight the flexibility and the responsiveness of the model to adapt to unanticipated social, health, and environmental challenges to build more resilient communities.
4. Revisit the following recommendations made in the report we produced at the end of Year 2 for more specific guidance for the different audience groups:
    - Continue to foster the CoP, including with engagement a range of stakeholders across municipalities, and emphasize ways in which their engagement has direct impact on their everyday work and practice, beyond this project.
    - Facilitate or create opportunities for the CPR teams to engage organizations and individuals in each municipality in more inclusive ways.
    - Develop and implement a plan to support educators carrying out the multiple responsibilities they have taken on, such as providing necessary curricular tools, allowing educators to engage closely with NEAq, and setting realistic timeline and project expectations.
    - Encourage educators to incorporate lessons with their students that touch upon the range of civic actions community members can engage in.

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Promoting Education through Action

Promoting Education through Action for Conservation of Habitats (PEACH) seeks to increase awareness of environmental issues and knowledge about local habitats among Boston-area volunteers, and develop skills for making informed environmental decisions. With support from the Environmental Protection Agency, PEACH brings together the New England Aquarium, National Parks of Boston, Emerald Necklace Conservancy, Trustees of Reservations, Massachusetts Audubon and Speak for the Trees Boston to provide resources, collaborate, and build capacity in each of the project partners. This report presents the results of two years of evaluation activities.

The Year 1 evaluation showed that project partners felt their volunteers had gained skills in responding to local conservation issues. Partners found the collaboration with project partners and other organizations to be a highly valuable outcome of PEACH, helping them to expand their capacity, further their mission, and solidify PEACH's specific outcomes. In Year 2, partners highlighted opportunities for collaboration and connection as crucial to the success of their organizational missions. In Year 2, partners collectively identified strategies for expanding and diversifying their volunteer base, and shifted the focus of volunteer training from specialized to more generalized skill development.

Introduction

Promoting Education through Action for Conservation of Habitats (PEACH) is a project led by the New England Aquarium (NEAq), in collaboration with five local environmental organizations: National Parks of Boston, Emerald Necklace Conservancy, Trustees of Reservations, Massachusetts Audubon and Speak for the Trees Boston (who joined in Year 2). PEACH seeks to increase awareness of environmental issues among Boston-area volunteers, increase knowledge about local habitats, and develop skills for making informed environmental decisions. With support from the Environmental Protection Agency (Grant #NE00A00338), PEACH provides training opportunities through organizational partnerships focusing on field-based habitat restoration opportunities and education for the public. The project also aims to build capacity in each of the organizational partners, including supporting and preparing volunteers to engage in citizen science efforts and deepening collaboration among partners.

Knology, a long-time collaborator with NEAq, is the evaluation partner on the two-year PEACH project to assess program impacts on volunteers and staff at partnering organizations.

For volunteers, Knology assessed their:

- Knowledge of specific habitats and their connections to local environmental issues;

- Perceived self-efficacy as community change agents to support local habitat restoration projects; and
- Sense of community in a group that is committed to local environmental issues.

For partner organization staff, Knology assessed their:

- Perceived value added for programs, including new skills, knowledge, and resources; and
- Collaborative capacity to engage residents in restoration efforts.

Methods

To address the evaluation objectives of the PEACH project, Knology asked partner organization staff to complete quarterly journals, and volunteers to fill out a survey.

Instrument

Staff Journals

Staff at partner organizations were asked to participate in quarterly journaling exercises to reflect on their experiences throughout the project (Appendix A). The purpose of this activity was for partners to continually self-reflect on the value of the PEACH project, their needs, their successes, and their challenges, in order to understand how the program can grow and become more effective.

Journal prompts sought to assess the outcome of perceived value added for programs (including new skills, knowledge, and resources). Staff were asked to reflect on the various ways PEACH was enhancing their volunteer programs. The journals included prompts about skill building, awareness of new resources and techniques, and projects relevant to their work. To assess the collaborative capacity of programs to engage residents in restoration efforts, staff were asked to comment on perceived successes and challenges in implementing the project, and their future aspirations for PEACH. We also encouraged staff to consider suggestions for improving the PEACH model for volunteer-based local restoration efforts.

In Year 1, we collected journals for Quarters 2, 3, and 4 of the project. We also collected responses from all five participating organizations for Quarters 2 and 3, and all but one organization for Quarter 4. Due to timing and delays in contract signing, we did not collect journals from Quarter 1.

In Year 2, we collected journals for all four quarters. Five participating organizations provided responses for the first and last quarter. We received responses from four organizations in Quarter 2, and three organizations in Quarter 3.

Volunteer Surveys

In Year 1, we intended to develop a pre-program survey to assess volunteers' knowledge of habitats and connections to environmental issues, along with their perceived self-efficacy as

community change agents to support local habitat restoration projects. Due to difficulties in data collection, we did not complete pre-program survey data collection in Year 1.

Due to programmatic developments, Knology and the leadership team decided to revise the instrument prior to using it with new volunteers in Year 2. These modified questions asked volunteers more generally about their learning experiences, as opposed to specific questions about knowledge acquired from the individual workshops or trainings they attended. The survey explored three main themes (Appendix B):

- Their understanding of relevant topics in their communities, as well as their knowledge of how to address these topics in their communities as an indicator of preparedness for undertaking restoration in their areas;
- Their attitudes and perceived efficacy in undertaking local habitat restoration work, including their personal beliefs about capacity to engage with their communities; and
- How they feel about being part of a group unified by interest in local environmental topics, including questions about how individuals define the group, perceive a close emotional connection with it, identify with it, believe in collaborating for success, and envision a legacy for future members of the group.

In this report, we share combined responses from Years 1 and 2 for questions that were asked in both iterations of the survey. We do not report on responses to questions that were removed from the first iteration of the survey.

Participants

Staff Journals

Project partners invited staff at their organizations to participate in the journal evaluation activity. Throughout both years, two staff members from New England Aquarium completed the exercise, along with one staff member each from National Parks of Boston, Emerald Necklace Conservancy, Trustees of Reservations, and MA Audubon. Speak for the Trees Boston staff began responding to journal prompts in Quarter 3 of the second year of the project.

In Year 1, we received six responses each in both the second and third quarter, and five responses in the fourth quarter. In Year 2, we received six responses in both the first and fourth quarter, and four responses in the second and third quarter.

Volunteer Surveys

A total of 26 participants responded to the surveys. For the first iteration of the survey, we collected data from July to September 2018, and received 15 completed responses from volunteers. For revised version of the survey, we collected data from May through July 2019, and received 11 completed responses from volunteers. Subsequent reporting shares combined *n*'s where applicable.

Of the 26 total respondents, 20 identified as White/Caucasian, 1 as Hispanic/Latinx, and 2 as Asian (the remainder did not report their race/ethnicity). Volunteers ranged from individuals in their teens to their seventies, with most volunteers under the age of 40.

Table 5. Age distribution of volunteers.

Year Born	n
1940-1949	1
1950-1959	1
1960-1969	2
1970-1979	3
1980-1989	8
1990-2000	8

*Note. The survey was not distributed to minors.

In the first survey, most participants began volunteering with PEACH within two and eight months of taking the survey. In the second survey, all but one of the participants began their involvement with PEACH in the same month they took the survey. Many of the participants had previous experience volunteering with other organizations involved in the project (Table 6).

Table 6. Past volunteer experience.

Organization	n
Emerald Necklace Conservancy	6
Massachusetts Audubon Society	11
New England Aquarium	12
National Parks of Boston	6
Trustees of Reservations	7
DCR North Region*	2
None	5
Other**	5

*Only asked in first iteration of survey
** 'Other' responses included NH Audubon, Brookline Conservation Commission, The Arnold Arboretum, The Nature Conservancy, The Boston Area Rape Crisis Center

Analysis

Staff Journals

A Knology researcher organized all qualitative data from staff journals into a framework in order to identify consistent themes across each question. This approach allowed us to identify the specific ways that PEACH added value to staff's programming, and to what extent collaboration is happening over time. Due to the limited amount of data, we report findings by themes that emerged across journals overall, rather than reporting on statistics (e.g., frequencies and percentages).

Volunteer Surveys

This report presents the frequencies of responses for rating items and coded themes from the descriptive responses to open-ended items where applicable. Responses from both versions of the survey were combined for reporting. SD, D, N, A, and SA, respectively mean Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree, and *n* denotes the number of respondents or responses. Percentages are not shared because using percentages for a small sample size such as this would be misleading for the interpretation of the results.

Results

Knowledge

Staff Journals

Through journaling exercises in Year 1, participants generally agreed that PEACH helped support their organizations' missions. Both staff and volunteers acquired knowledge that benefitted their programs' objectives of environmental stewardship such as how to teach people about local environmental issues, knowledge of local flora and fauna, and native seed gathering. Participants also said they gained a more general understanding of the mission of the project and collaborative conservation work.

Staff appreciated PEACH's encouragement and consideration of their organizations' existing paradigms for volunteering. Additionally, they appreciated PEACH's support for their efforts to provide experiences for local residents to engage more with their local area, as well as to help non-residents learn about and work in a new setting. Journals also revealed that in the future, participants anticipated benefitting from learning how to determine best practices for getting volunteers involved.

In Year 2, partners felt that the volunteer corps had a better understanding of the ecosystems they were working in, and had learned more about various environmental science topics such as tree identification and shorebird monitoring. They reported that volunteers were excited to be involved in projects and to learn more about environmental issues. As one partner put it, *"PEACH did a great job reaching out to volunteers to get them in the room and teach them about our mission, values, and goals."* Moving forward, the partners expressed interest in additional field opportunities and service projects that would help their volunteers learn more about habitat restoration. They also planned to continue developing focused trainings and workshops.

Volunteer Surveys

The survey asked volunteers to share the workshops they attended through the PEACH project. The majority attended workshops on bird habitats (Table 7).

Table 7. Workshops and classes attended.

Event	2018	2019
Bird habitats	14	3
Invasive species	6	8
Native plant species	3	1
Citizen science	NA	3
Other	1	1

In addition to being asked about their experiences with the trainings and workshops, they were asked to reflect on their learning as a volunteer overall. Volunteers almost unanimously agreed that this positive learning experience taught them about their local ecosystem and how to care for their local habitat (Table 8).

Table 8. Knowledge of habitats and connections to environmental issues.

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I have learned new information about Boston's local ecology	0	0	0	4	7
I am more aware about how people impact Boston's local ecology*.	0	1	2	14	9
I have gained science knowledge related to Boston's local ecology.	0	1	0	3	7
I have developed new skills to help residents take care of Boston's habitats.*	1	1	2	14	8
I have developed new skills to share information about Boston's habitats with Boston residents.	1	0	1	3	6

*Note. Includes survey data from 2018

Skills and Self Efficacy

Staff Journals

In Year 1, participants described skills they had acquired from their engagement with PEACH, along with skills they hoped to acquire through future involvement. Participants felt that PEACH led to more diverse workshops and trainings for volunteers. They expressed hope that these trainings would continue in the future, equipping volunteers with the skills and knowledge needed to become educational leaders for their local environments.

Some participants in Year 1, however, felt the project had not been as successful as it could have been regarding skill development, due to training volunteers on one specific initiative (i.e., local species). This limited their involvement with PEACH overall. Along those lines, one participant mentioned that the skills needed by volunteers varies between projects and

requested trainings that teach general skills useful for volunteers on all projects to help create a volunteer platform that could be transferred over to any project quickly.

After going through the first year of the project, participants shared that in the future, they could also benefit from the development of a system that supports volunteer orientations, trainings, recruitment, data-collection, and feedback collection that operates on a more regular schedule.

Partners observed skill development in volunteers throughout Year 2. Most notably, they saw volunteers learn what it means to be a good volunteer, and felt that the skill level and excitement of the group was one of the most valuable aspects of the project overall.

In Year 2, partners noticed leadership skills developing in their volunteers and felt that dedicated volunteers could start to take on leadership roles in the group. One partner shared that one of their more seasoned volunteers had been attending new volunteer trainings to "*make connections between more experienced and incoming volunteers*". Partners continually expressed the hope that volunteers would take on more of a leadership role in projects (such as at events), and in creating curriculum and programming.

Partners also drew attention to other specific skills volunteers developed, such as mapping, climate communication, volunteer management, shorebird identification, invasive plant clearing, and trail maintenance and safety. Partners hoped for additional training on education techniques and communication best practices to continue to build these skills in their volunteers.

Volunteer Surveys

Volunteers reported positive perceptions of their ability to make a difference in their communities (Table 9). Most felt confident that they would continue participating in habitat restoration efforts after their experience with the program, but they also felt very strongly about making connections with new people, and building friendships with others in their community through habitat restoration.

Volunteers felt that they were making a positive impact by improving habitats in their community, and felt that what they learned through these projects could be applied in a more general way to solve "real life problems." Volunteers felt less confident about promoting social justice and helping people in need through habitat restoration.

Table 9. Self-efficacy as community change agents.

Item	Strongly Agree	Disagree	Neutral	Agree	Strongly Agree
I will be able to make a meaningful contribution by engaging in habitat restoration actions to improve habitats in my region.*	0	0	4	12	9
I am confident that, through habitat restoration, I can help in promoting social justice.*	1	0	9	9	7
I am confident that, through habitat restoration, I can meet new people and build new friendships.*	0	2	3	8	13
I am confident that I can help individuals in need by participating in habitat restoration activities.*	0	0	8	12	6
Through engaging with habitat restoration projects, I can apply knowledge in ways that solve "real-life" problems.*	0	1	6	10	9
I am confident that I will participate in habitat restoration efforts in the future*	0	0	2	9	15

*Note. Includes survey data from 2018

Resources

Analysis of Year 1 staff journals revealed that the two most valuable resources staff obtained were having a larger and more diverse volunteer base and forming relationships with other organizations as a result of the project. Other frequently mentioned resources resulting from PEACH included meeting spaces, in-person training, training materials, and new service opportunities. Staff named projects they perceived to be especially effective resulting from PEACH resources (e.g., the Bluebird Nest Project and the Coastal Waterbird Program.)

Staff could identify various benefits of new resources. For example, partner organizations had greater access to a larger volunteer base, which encouraged them to improve their project management practices. Another shared how PEACH's support allowed them to hire a project assistant, increasing the capacity of events, recruitment, and meetings.

In Year 1, some partner organizations felt limited in their ability to bring the project to fruition beyond recruiting a few new long-term volunteers. Regardless of the numbers of volunteers they recruited, multiple staff highlighted the positive impact that a single energetic, highly motivated, personable volunteer can have.

By Year 2, partners felt they could offer volunteers resources not previously available to them, including trainings, tools, and support. At this point, partners felt that volunteers had many diverse opportunities to get involved, and that engagement was more accessible as a result of the portal, which made communication easier. Some partners hired more field staff to develop strategies for volunteer engagement and to solidify partnerships with other

organizations. One organization hired a volunteer leader to bring additional knowledge and skills to volunteers. Partners also came up with ideas about additional resources that could best support training for their volunteers, such as more training and general educational opportunities. Some had more specific ideas such as building a framework for a successful and accessible leadership program, and specific topics they wanted to focus on (i.e., shorebird training and pollinator training).

Collaboration and Sense of Community

Staff Journals

At the end of the first year of the PEACH project, all three quarters of participants' journal responses indicated the benefits of collaboration, and many highlighted collaboration itself as the greatest benefit of PEACH. We found something unexpected in the way staff referred to the partnership between the organizations. In their journal entries, they indicated their gratitude for the "community of practice" that PEACH embodies. This term refers to a framework for collaboration that NEAq continues to use with their educators, which was not an explicit goal for the PEACH project. Staff described how the partnership, as they perceived it, led to greater access to resources, a larger volunteer base, new locations for projects, and greater dissemination of the principles of PEACH and partner organizations.

Throughout Year 1, staff expressed hope that increasing collaboration between organizations would enable greater volunteer engagement and recruitment. We also heard that collaboration would help get projects off the ground more quickly. However, collaboration between volunteer groups was not always seamless. Sometimes, it was challenging getting long-term volunteers from other organizations involved with PEACH. Journal responses suggested that providing an overall introductory volunteer training about PEACH might remedy this obstacle. A suggested strategy for collaboration included holding joint trainings to better understand the various needs of different organizations.

Responses contained in staff journals from Year 2 of the project showed that partners hoped for more collaboration, to create new partnerships, and strengthen existing ones. They demonstrated the depth of their commitment by signing MOUs with other organizations, and meeting with prospective new partners they hoped to onboard in the future. As the year progressed, partners felt that connections and collaborations with partner organizations were among the most valuable aspects of the project. Although many of these organizations had worked with each other in the past, PEACH gave them the chance to connect and enhance other partners' work. As said by one partner, "*The PEACH project has allowed those relationships to deepen [through] sharing connections, brainstorming best practices, training each other's staff and volunteers*."

Through what some partners referred to as a community of practice, which continued to develop in Year 2, partner organizations supported one another and developed ideas for recruiting, training, and building leadership into their volunteer corps. They shared resources, participated in workshops, and shared best practices for volunteer management.

By the end of the project, partners identified collaboration as the biggest success of the project. They felt that these partnerships not only enhanced organizations' work on the

PEACH project, but on many of their other working programs. Within PEACH, the ability to collaborate resulted in unique programming that leveraged varied skills, interests, and expertise. Organizations were able to reach a much broader audience and build conservation awareness among members of the community.

Partners specifically highlighted the unique value NEAq brought to the project as a "*strong force for convening the region's environmental groups,*" and appreciated their continued support and "*positive attitude and commitment to equity and access.*"

Table 10. Perceived sense of community.

Item	Strongly Agree	Disagree	Neutral	Agree	Strongly Agree
I get important needs of mine met because I am part of this volunteer group	0	0	0	8	3
The other volunteers and I value the same things	0	1	0	6	4
The volunteers have been successful in getting the needs of its members met	0	0	1	7	3
Being a member of this volunteer group makes me feel good	0	0	1	4	6
When I have a problem, I can talk about it with other volunteers.	0	0	3	6	2
The members of this volunteer group have similar needs, priorities and goals.	0	0	0	6	5
Fitting into this volunteer group is important to me.	0	1	3	5	2
This volunteer group can influence other communities.	0	0	0	5	6
I care about what other members of this volunteer group think of me.	0	0	4	5	2
I have influence over what this group of volunteers is like.	0	0	5	5	1
If there is a problem in this volunteer group, members can get it solved.	0	0	1	6	4
This volunteer group has good leaders.	0	0	0	6	5

Volunteer Surveys

All but one volunteer reported that feeling a sense of community with other habitat restoration volunteers was very important, with the majority saying that it was very or extremely important. This was echoed by volunteers who reported highly positive feelings associated with being part of the volunteer group. These feelings were bolstered by the fact that their fellow volunteers shared similar values, needs, priorities and goals (Table 10).

Volunteers felt that together, they could influence other communities, and that their collective voices were heard. Survey results indicate that volunteers see this group as well knit, competent, and action-oriented, with strong leadership.

Discussion

In the first year of the project, staff journals highlighted the initial successes and challenges of the PEACH project. Overall, staff who shared journal responses appreciated the trainings geared towards building volunteer capacity. They recognized the value of engaging more volunteers, and developing skills to address local conservation issues. Collaboration among organizational partners was considered one of the strongest aspects of the PEACH project. Staff especially felt that this approach had helped grow a community of practice among groups, who thought of themselves as working towards shared goals, and having a lot to learn from each other with regard to building volunteer capacity and engagement. Staff expressed hope for volunteer training aimed at general skills development, as these (rather than specifically focused skills) would help volunteers be more versatile across projects. The leadership team took this into consideration for Year 2, and focused more generally on volunteer skill development overall to build competent volunteers. In Year 2, the following themes emerged from staff responses at partner organizations and volunteers:

Access and Diversity in the Volunteer Corps

The PEACH project identified strategies and techniques for successfully expanding and diversifying their volunteer base across numerous organizations. Together they were able to reach a larger audience, and learned how to address barriers to engagement in their programming. Barriers relating to volunteerism for low-income communities, immigrant communities, and communities of color were of particular importance.

Developing Volunteer Capacity

As the PEACH project developed, the volunteer training model moved from specialized skill development to more generalized skill development. Partner organizations began viewing increased capacity not as quantity (a higher number of engaged volunteers) but as quality, with staff and volunteers who have more of the skills necessary to manage restoration efforts in line with best practices for a variety of habitat types.

With this transition in approach, project partners noticed leadership skills developing in their volunteers, and felt that dedicated volunteers could start to take on leadership roles in the group. They observed volunteers learning what it means to be a good volunteer, and felt that the skill level and excitement of the group was hugely valuable. Through PEACH, partners felt that they were able to enhance the quality of volunteers overall, increase their capacity and competence, and offer ways for volunteers to enhance their skills in the field of conservation service.

Connecting to Local Habitats

Through their experiences with PEACH, volunteers gained a better understanding of their local ecosystem and the human impacts on the environment. As their knowledge of local environmental issues grew, volunteers gained a sense of agency in feeling that they could improve habitats in their region through restoration activities. In addition to building awareness and connections to their local habitats, participants also felt that restoration activities helped them develop friendships with other members of their community.

Building Meaningful Relationships

PEACH partners consistently highlighted the value of the relationships they built with the other participating organizations. Partners identified this group as a community of practice, whose members supported each other and enhanced each other's work not only on PEACH, but towards their organizations as a whole. Together, they have developed what they believed to be a viable model for volunteer engagement. Through the pooling of resources and tools, collaborative planning of workshops, events and trainings, and access to a larger volunteer base, they were able to enhance the skills and capacity of volunteers across a wide range of audiences, and build conservation awareness in members of the community. Partners anticipated that the connections they made with organizations through PEACH would last into the future.

In addition to the meaningful connections made between partners, volunteers also built a tight-knit community of their own, one they felt had trust, support, and agency in the group. Through this group of individuals who shared values and goals, they felt they were able to make a difference in their community together.

Recommendations

Based on evaluation findings, we make the following recommendations to continue supporting this model in the future:

- Continue to refine and articulate the volunteer model that PEACH developed for future cohorts, and for wider dissemination beyond NEAq. We anticipate value in describing the key components of this model, and the ways it builds capacity for organizational partners to continue supporting and fostering a community of volunteers.
- Expand the set of resources currently available to support volunteers by systematically developing protocols and guides, including those that identify and address barriers to volunteer engagement. This could result in a "best practices" resource highlighting ways to remove barriers to volunteerism for specific communities. Removing barriers can also mean offering more frequent, shorter trainings, along with regularly scheduled volunteer days (as one partner suggested, "Conservation Saturdays").
- Establish strategies and techniques at the start of the project to maximize volunteer participation and continued engagement. This could include outreach techniques, and introductory resources for volunteers to provide structure and expectations.

- Leverage institutional resources to continue to support the community of practice among partner organizations, and between groups of volunteers. Insights from past models that NEAq developed could provide specific guidance to support and sustain these groups in the long term.
- Nurture leadership skills in volunteers by leveraging existing participants to take on a leadership role with new volunteers.

Conclusion

Partner organizations in the PEACH program highlighted the community building and volunteer engagement support they received as crucial for the fulfillment of their respective missions. Through their participation in the program, partners formed new connections and deepened existing ones in ways that were meaningful and beneficial to their work. The commentary offered by staff and volunteers point to an ongoing need for more volunteer-specific resources, as well as greater support for a burgeoning community of practice forming among the partner organizations. We codify these suggestions into a list of recommendations included in this report to provide a roadmap that we believe will help PEACH build on the foundation it has established, in ways that maximize its impact moving forward.

Conclusion

NNOCCI was initially conceived as a program for informal learning institutions to use shared language and build professional practice among those charged with communicating about climate change. Following the success of the program's efforts to create a trauma-informed approach to training and building a Community of Practice, the lessons learned presented more robust opportunities to expand the community impact by experimenting with different networks and groups who shared network members' communication goals.

The projects found that partnerships with organizations of similar scale and capacity that engage with volunteers or run youth programs could build strong ties that leveraged shared goals and beliefs. The results suggested that it is possible to seed a community wide effort to diversify opportunities beyond scales they can each reach individually. The work confirmed that democratic deliberative processes helped strengthen relationships between organizations, and in so doing, increased impact.

In contrast, partnerships with small community-based non-profits and agencies showed promise, but require deep dialogue on the principles of equity in funding, time and effort, and scheduling to ensure trust is developed. While the rudimentary elements of a Community of Practice were beginning to emerge in the two projects that focused on this domain, the grant funding did not extend long enough for members of those small groups to fully realize the value they could gain from the collaboration.

On this latter point, we note that the COVID-19 pandemic may have limited the full recognized value of being in an asymmetrical community of practice. Despite this, of the two test sites, the Long Beach group continues to work toward common goals and efforts. The New England program witnessed near 100% attrition of members and ceased operations in late 2020. This suggests that the theory itself was viable, but that partnership survival requires strong personal relationships—the central scaffold on which success hinges.

These findings demonstrate that the NNOCCI community of practice model can be extended to partnerships that work with similar content, or local environmental justice issues. We recommend that any further efforts, however, highlight the central tenets of a community of practice, and involve future partners in self-reflection using the assessment frameworks developed by Wenger, Traynor, and DeLaat (2011) to ensure that all partners can calibrate the value they derive from partnerships, and how their own contributions and received value help them achieve their mission.

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