A Brief "CAISE History"

By Jamie Bell and David Ucko

The Center for Advancement of Informal Science Education (CAISE) will be sunsetting at the close of the 2022 calendar year. Based at the Association of Science and Technology Centers (ASTC), the professional association for North American science centers and museums, with co-PI leadership from around the US, CAISE has served as the resource center for the US National Science Foundation's (NSF) Advancing Informal STEM Learning (AISL) program and its predecessor program, Informal Science Education (ISE) since 2007. CAISE has received 15 years of funding via three NSF awards to support, strengthen and advance the professional field by providing infrastructure, connectivity, and tools for knowledge and capacity-building. However, sunsetting doesn't mean the end of these key functions. CAISE is currently in the process of facilitating the transition of the AISL program's resource center to a new team of partners, hosted at TERC. This inflection point provided an opportunity to recap some of CAISE's history as well as to reflect on how CAISE's efforts and field developments have coevolved. Whenever possible this piece also provides links to InformalScience.org pages that contain resources that CAISE has created and produced over the years, as well as documentation of activities that CAISE has conducted or hosted. InformalScience.org is the website and repository that CAISE has developed and maintained since 2012, which is also in the process of being transferred to the new AISL program resource center who will continue to build on and evolve it.

BACKGROUND/CONTEXT

The 2006 NSF ISE program solicitation requested proposals for an Informal Science Education (ISE) Resource Center that would serve the ISE field writ large, as well as the NSF ISE program and the principal investigators that it funded. That solicitation was part of a series of NSF efforts to build capacity, strengthen infrastructure, and further professionalize the ISE field.

One example of these efforts was the Nanoscale Informal Science Education Network (NISE Net), co-funded by the NSF research directorates, that created a new model for addressing the challenge of engaging the public in current science and technology. NISE Net fostered collaboration at a national scale for sharing programs and exhibits among science centers, along with partnerships between the staff and nanotechnology researchers. Other projects laid the groundwork for using the internet to share resources widely, including ASTC's ExhibitFiles, a dynamic online system for contributing to, using, and communicating about a database of permanent and temporary exhibitions, and the first instantiation of the informalscience.org website at the University of Pittsburgh Center for Learning in Out-of-School Environments' (UPCLOSE) for researchers and practitioners to disseminate knowledge about informal science learning.

Another key project involved an effort led by the National Research Council and the Board on Science Education at National Academies of Science, Engineering and Medicine to conduct a synthesis study of the research underlying informal STEM learning. Its goals were to provide evidence-based guidance for those developing and delivering informal learning experiences, to broaden the definition of ''learning'' beyond that typically used in formal education, to encourage knowledge sharing across the field, and to establish a base for future research. The outcome was the seminal *Learning Science in Informal Environments: People Places and Pursuits* (aka "The LSIE") consensus report published by the National Academies Press.

Internally, the NSF division that housed the ISE program was undergoing a major transition, merging the division of Elementary, Secondary, and Informal Education (ESIE) with the division of Research, Evaluation, and Communication (REC) to form the Division of Research on Learning in Formal and Informal Settings (DRL). This organizational change increased the focus on seeking to fund transformative research and development (R & D), consistent with NSF emphasis on R & D overall.

Externalities, such as the US Department of Education's formation of the Academic Competitiveness Council (ACC) in 2006, also played a role. The ACC goals were to identify all federal programs with a science education focus; assess their effectiveness; determine areas of overlap; and make recommendations to integrate, coordinate, or eliminate programs. Its activities were supported by the Coalition for Evidence-Based Policy, which promoted randomized controlled trials as the quantitative standard for "scientifically-rigorous" independent external evaluation. The

ISE program sought to identify other rigorous means of evaluation by organizing a workshop of informal science education experts. The resulting report, *Framework for Evaluating Impacts of Informal Science Education Projects*, was designed to help awardees think about and articulate project impacts, encourage effective use of evaluators, and increase sophistication of summative evaluations.

These projects, along with other internal and external influences, provided the context for funding an Informal Science Education Resource Center. Its goals were to foster a community of practice and leverage and amplify other related ISE-funded projects; further research and evidence-based guidance beyond the National Academies report; serve as a catalyst for transforming informal STEM learning consistent with the DRL mission; and assist the NSF ISE program in identifying evidence of impact based on the Framework. This Informal Science Education Resource Center would be the next step in an ongoing ISE effort to further advance the field. In the words of CAISE evaluator Mark St. John of Inverness Research Associates, it offered a way to "improve the improvement infrastructure."

FIRST AWARD PERIOD 2007-2012

The first five-year CAISE cooperative agreement award was made to the Association of Science-Technology Centers in partnership with the Institute for Learning Innovation, University of Pittsburgh Center for Learning in Out-of-School Environments, the Visitor Studies Association, and other collaborators. Unlike a regular grant, a cooperative agreement allows for "substantial staff involvement" from NSF with the award, which created the conditions for an iterative collaborative approach to building the Center and identifying and developing structures, activities, and resources that would support the advancement of the ISE field.

An early CAISE effort to identify some of informal science education's field-building needs was a landscape study of how those working in a variety of ISE settings identified with the ISE field with regard to their role and goals. The investigation focused on a sample of professionals working across ISE sectors, e.g., science museums and centers, media, out of school times programs and science journalism, via a survey that asked each respondent the degree to which they saw themselves as being part of the field of informal education and the

degree to which STEM understanding was the goal of their work (Fig 1). The resulting report concluded that the ISE field was not yet a functioning community of practice writ large. Instead it had many functioning subsectors, which together with some effort might become a coherent and interacting community of practice.

Other investigations involved the formation of "Inquiry Groups" who were charged with exploring and characterizing the state of the ISE field in areas such as Public Engagement with Science (PES), Public Participation in Scientific Research (PPSR), Collaborations Between Informal Science Organizations and Schools , Informal Science Education Policy, and Inclusion, Disabilities and Informal Science Learning. The topics of inquiry and composition of these groups were identified by the CAISE leadership and steering committee (advisors), in collaboration with the NSF ISE program officers. Each Inquiry Group produced a report that was posted on the CAISE website. Additional inquiry groups that studied field infrastructure and learning, approaches to developing professional online communities and trends in the ISE program portfolio over time, informed internal CAISE activities but did not produce public documents.

Another core activity of the first award period was creating a Leadership and Diversity Fellows program and coordinating the activities of two cohorts of Fellows between 2008-2010. The Fellows program, modeled on ASTC's program for diverse professionals in science centers and museums, included opportunities for emerging leaders from underrepresented groups and states to participate in inquiry groups, attend NSF ISE program principal investigator (PI)
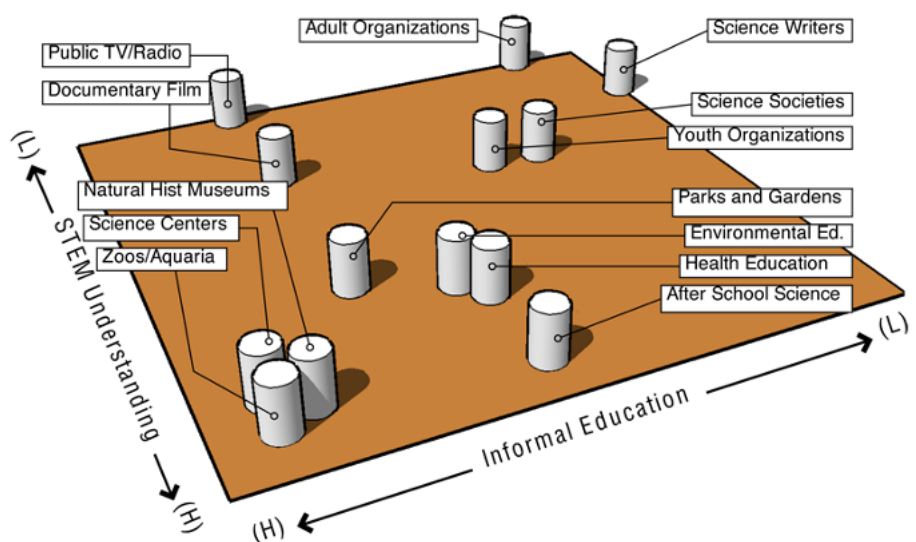

Figure 1: ISE Landscape.

meetings, and engage in NSF proposal development workshops.

When CAISE was funded, there hadn't been an NSF ISE program PI meeting for the previous eight years. Hence, planning, organizing, hosting, and documenting the 2008 PI summit was a key function for CAISE. The Framework for Evaluating Impacts of Informal Science Education Projects was launched at the meeting and CAISE coordinated PI-led workshops on developing evaluation plans and "big ideas" for ISE projects. With the success of this Summit, PI meetings settled into a biennial rotation, beginning with the 2010 Summit which was a "big tent" event to which CAISE and the NSF ISE program invited leading ISE professionals and projects, beyond the NSF ISE portfolio. The event featured Neil deGrasse Tyson as the keynote speaker, and presentations of in-progress inquiry group findings, followed by comprehensive documentation of the Summit by Catherine McEver.

The National Academies/National Research Council's *Learning Science in Informal Environments: People, Places and Pursuits* consensus report, having just been released, figured prominently at the 2010 Summit. The companion *Surrounded By Science* volume for practitioners was also launched at the event. Summit attendees were invited to participate in an activity to create an "ISE Timeline" that tracked the history of events, publications, and people in the field writ large from the 1930's and 1940's until 2010. They used sticky notes to nominate items, as well as to indicate when they became involved in ISE work.

Following on the success of organizing inquiry groups and NSF ISE program PI meetings, CAISE also began holding a series of small convenings, beginning in the summer of 2011 with one on ISE broadcast and internet media, a sector that had- at the time- been receiving almost a quarter of the NSF ISE program funding. In what became a model for follow-up convenings, a group of PIs and evaluators from television, film, and radio came together to share what they were learning from producing and studying their projects, and to discuss potential activities for further knowledge-building. The momentum from that small convening catalyzed a separately-funded second convening, held a day prior to the 2012 PI meeting. A larger group of ISE media professionals discussed the possibility of initiating a professional association for ISE media producers and practitioners, similar to ASTC, for example. A session to promote the idea was conducted at the 2012 (first) Jackson Hole Symposium, Wildlife Film Festival and Media Awards at the Denver Museum of Science and Nature. That organization, later rebranded as Jackson Wild, now also biennial summits, which have become a key US-based gathering for STEM media community -building.

In 2008 CAISE launched its first website, InSci.org, and the first "briefCAISE" newsletter (Fig. 3). The ISE community was invited to submit brief descriptions (called "Sparks") of how their projects and programs were engaging intended audiences, along with a compelling thumbnail image. CAISE compiled and combined the Sparks into the featured r image on the website homepage that portrayed the variety of the field and served as a call to action for sharing knowledge. The newsletter included a "Spotlight" on an in-progress NSF ISE-funded project, updates on funding opportunities, links to recently-released CAISE resources and news about field-relevant events, all of which were also posted on the website. It was the beginning of a documen-
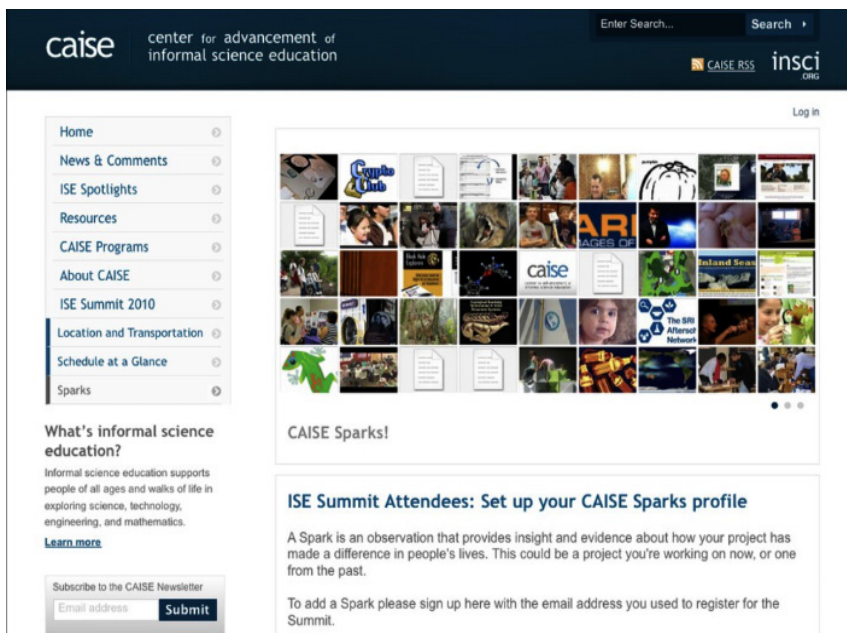

Figure 2: *"ISE Timeline".*

Figure 3: InSci.org homepage with "Sparks" image.

tation and communication model that continued, evolved, and improved through three funding cycles.

In 2010 CAISE invited leaders of 9 other ISE projects and organizations with significant investments in websites to the first Infrastructure Coordination Roundtable. This group met four times to negotiate and develop a metadata standard for tagging and pooling each site's resources into what became an "Informal Commons" website repository of informal science education knowledge. While developing and maintaining that site along with InSci.org, CAISE became aware of the field's need for synthesized summaries of what practitioners, evaluators, and researchers were learning during the implementation of their projects. In collaboration with the Visitor Studies Association (VSA), CAISE prototyped and developed an "ISE Evidence Wiki" site that crowdsourced and organized brief synthesis articles on ISE work that sought to characterize the current state of the field with regard to ISE setting, STEM topic, audience, learning approach, and theoretical foundation.

CAISE also leveraged its partnership with VSA to engage association member practitioners and evaluators in the development of a *Principal Investigator's Guide to Managing Evaluation in Informal STEM Education Projects*. This six-chapter resource document would help those who design informal learning settings and activities better understand and use evaluation as a tool for improvement and knowledge-building, as well to work more equitably and effectively with evaluators.

SECOND AWARD PERIOD 2012-2015
In 2012 CAISE was funded for three years via a non-competitive proposal process. The award period began with the implementation of plans to integrate the InSci.org, Informal Commons, and ISE Evidence Wiki websites within InformalScience.org, the site that then had the largest collection of ISE evaluation reports and other resources for field professionals. The Informal Commons site was folded into what is now the Community Repository on the current InformalScience.org site, with over 9000 resources including project descriptions, evaluation reports, and research articles. The ISE Evidence Wiki became the Knowledge Base, a mixture of 74 articles that were either crowdsourced, commissioned, or contributed as project dissemination strategies. And InSci.org was reorganized to become the place on the new InformalScience.org where Spotlights, Events and Deadlines calendar and other CAISE resources were posted. Beginning in late 2011 and early 2012, CAISE organized small convenings on areas of substantial investment in the NSF ISE portfolio, including topics such as Organizational Networks, Professional Development, and Sustainability Science and Informal Science Education. These convenings, which involved teams of principal investigators and their evaluators, addressed common challenges, sharing successes, and exploring new opportunities. The Topics raised informed session planning for the 2012 NSF ISE Principal Investigator meeting, where participants in concurrent sessions were able to continue and build on discussions from the convenings.

In response to community feedback and input from the NSF ISE program, CAISE also launched and coordinated initiatives on Evaluation Capacity Building (ECB), Practice and Research (PAR), and Broader Impacts and Informal Science Education (BI+ISE). These initiatives focused on areas deemed ripe for professional learning, knowledge-building, and working more closely with STEM researchers and practitioners. The ECB initiative informed new Design Evaluation pages on the website; the PAR initiative resulted in a proposed Roadmap for research and practice, and the collaborators on the BI+ISE initiative wrote a report titled *Informal STEM Education: Resources for Outreach, Engagement and Broader Impacts*. Discussions from these initiatives' convenings informed concurrent and open space sessions at the 2014 AISL PI meeting, the first meeting after the NSF program changed its name to Advancing Informal STEM Learning (AISL). At this time CAISE also began using the term Informal STEM education (still ISE) to refer to the professional field and informal STEM learning to refer to the activities and behavior that practitioners design for and that evaluators and researchers study.

CAISE's success in developing, conducting, and documenting convenings led to the NSF director's office requesting that CAISE, in collaboration with NSF, plan and host the Achieving Scale for Inclusion in STEM convening, which laid the groundwork for NSF's Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (INCLUDES) initiative.

It was during the second award period that CAISE and the other NSF Division of Learning in Formal and Informal Environments (DRL) program resource center staff began meeting quarterly to share resources and discuss challenges and opportunities. During this award period, CAISE was also regularly invited to attend and share resources at meetings of program officers from across federal agencies that fund informal STEM learning activities. They included NIH, NASA, NOAA, IMLS, NEA, NEH, and the departments of Education, Energy, Agriculture, Interior, and the US Patent and Trademark Office.

By this time CAISE had fully operationalized its theory of action: Strengthening and advancing the field for practitioners, evaluators, and researchers by convening ISE professionals, making and facilitating connections, characterizing current topics, approaches and trends, and robustly communicating what we were learning through a variety of channels. The cycle of knowledge-building (Fig. 4) had also become an organizing scheme for the community repository during this period. It catalyzed CAISE's development of the InformalScience.org Developing Projects and Discover Research pages, complementing the previously mentioned Design Evaluation pages in service of informing and supporting these processes with resources.

THIRD AWARD PERIOD: 2016-2022
In 2016 CAISE received a new cooperative agreement award for an expanded scope of work. In response to field growth and the 15-593 NSF solicitation that acknowl-

Figure 4: The ISE development, evaluation, and research cycle.

edged science communication as a related and sometimes overlapping area of research and practice with ISE, CAISE began investigating and pursuing opportunities to seek mutual learning opportunities and synergy with organizations, projects, and professionals who identified more with science communication (SciComm) than STEM education.

At the outset of the award period CAISE convened an External Review Board with expertise to help shape and assess the impact of the expanded charge, and designed and conducted two baseline studies of the interaction and awareness of each other's work among ISE and SciComm professionals.

These investigations identified the following as common areas of challenge and interest between the informal STEM education and SciComm fields: integration of research and practice, better understanding and use of evaluation, and new ways of thinking about and enacting approaches to broadening the participation of underrepresented and underserved groups. CAISE also conducted exploratory interviews with ISE and SciComm field leaders to identify potential participants in task forces on evaluation and measurement, research and practice and broadening participation in STEM. Each task force ultimately included members who were practitioners, researchers, and evaluators from both informal STEM education and SciComm. The task forces met regularly over an 18-month period to investigate the current state of the field with regard to their topic area and identify needs, strengths, and opportunities (Fig 5).

The Evaluation and Measurement Task Force, with input from the NSF AISL program, identified learning and communication constructs as an area with a need for resources that would help practitioners better understand the theoretical foundations and practical applications of these constructs. Task force members recorded interviews with leading learning and science communication researchers and practitioners to produce a suite of video clips, full transcripts, and overviews focused on defining, recognizing and measuring STEM identity, interest, and engagement. The audience for these video interviews and the accompanying full transcripts were those who design or study experiences and settings where these constructs are either a learning goal or a consideration to be taken into account.

The Broadening Participation in STEM Task Force, over the course of in-person and online meetings and writing sessions set out to surface critical issues and challenges, including underlying systemic factors, that appeared to be constraining the ISE field's overall progress in broadening participation. The Task Force developed, piloted, and disseminated a toolkit on Broadening Perspectives on Broad-

ening Participation in STEM for institutional and organizational leaders to implement with staff who develop ISE or SciComm programs and activities. The goal was to support reflective conversations about equity and inclusion and identify shifts in practice toward broadening participation in STEM. Task Force members also conducted in-person and online sessions and workshops using the toolkit at both ISE and SciComm conferences.

The Research and Practice Task Force, with input from the NSF AISL program, investigated the range of existing resources, networks, and support for knowledge building and collaborative proposal development, and identified additional needs. Leveraging existing infrastructure and prototyping new content, the task force developed a Project Planner resource for prospective designers and researchers of equitable, collaborative projects that have the potential to build knowledge for the ISE and SciComm fields. The launch of this resource was timed to support those developing proposals for the 2020 AISL solicitation.
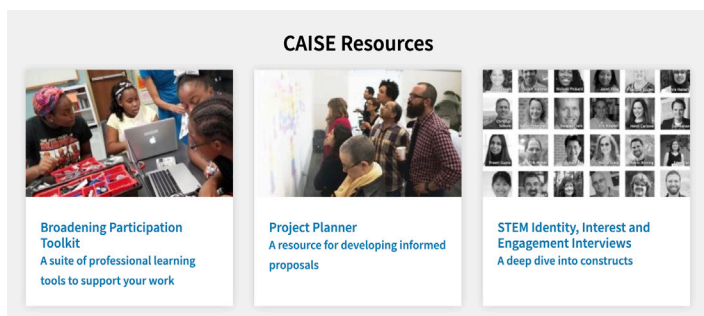

CAISE Resources

Broadening Participation Toolkit
A suite of professional learning tools to support your work

Project Planner
A resource for developing informed proposals

STEM Identity, Interest and Engagement Interviews
A deep dive into constructs

Figure 5: CAISE Task Force-Produced Resources.

In response to increasing requests for broader perspectives on the state of the ISE field and where it was heading, CAISE, with lots of input from advisors, in 2017 launched the first Year in Informal STEM Education resource. In the form of a downloadable slide deck, the "Year in ISE" was a listing of notable publications, events, and trends from each ISE 'sector' (i.e., museums, media, making, SciComm, etc.) over a one-year period. The larger ISE and SciComm communities contributed ideas for inclusion in each report, which CAISE compiled annually through 2020.

In 2016 and 2019 CAISE organized and hosted AISL PI meetings. At the 2016 meeting NSF contractor Westat presented an overview of the AISL Online Project Monitoring System, including findings from data collected from NSF ISE/AISL projects funded between 2006-2014. CAISE, with input from the NSF AISL program, planned the 2019 meeting to coincide with and immediately precede the AAAS annual meeting in Washington, D.C. This was one of many efforts during the third award period to provide opportuni-

ties for ISE and SciComm professionals to "boundary-span" and experience each other's meetings and knowledge-sharing events. The CAISE Broadening Participation and Evaluation and Measurement Task Force resources were launched at the 2019 meeting, where throughout the meeting sessions aimed to support discussions on the roles of identity, interest, and engagement in learning and communication in STEM, evaluation and assessment, and on centering equity and inclusion.

In December of 2019 CAISE convened the Research and Practice Task Force in what was to be the last in-person community-wide gathering that CAISE hosted. When the COVID-19 pandemic went global in March 2020, CAISE paused and reassessed its planned activities With input and support from the NSF AISL program, CAISE began compiling, curating, and posting new website pages such as NSF-funded projects with online learning resources and field-wide informal STEM learning resources for COVID-19 and online learning to help the field navigate the disruption of in-person ISE project and program work.

In response to George Floyd's murder in May of 2020 and the subsequent racial reckoning, CAISE began creating, collecting, and sharing resources to support the community in engaging with issues of systemic racism and long-standing societal inequities. These include a regularly updated Anti-Racism Roundup blog, a BIPOC VOICES interview/blog series, and daily social media posts with information and resources chosen to support anti-racist, inclusive, and equitable practices in in ISE and SciComm.

CAISE and the NSF AISL program had decided pre-pandemic that the 2021 PI meeting would include projects' community partners, and would be recast as the 2021 AISL Awardee Meeting. The pandemic required that the meeting be fully virtual, with both synchronous and asynchronous components, which provided opportunities for broader and accessible participation through recorded sessions and an online platform for presenting and discussing posters. After launching and disseminating the Broadening Participation Task force toolkit, CAISE felt it important to turn its attention internally and conducted an equity audit of its current and historical structure, practices, activities and communications. The Awardee Meeting also provided an opportunity to apply some lessons being learned from the audit to plan and conduct the event in more equity-centered ways.

CAISE chose racial equity as the specific focus of the audit and used several strategies to design and conduct the process. CAISE convened an external equity audit committee as critical partners to investigate, reflect on, and help evolve CAISE's practices, activities, products and commu-

nications with the goal of building a race equity culture. Using the Awake to Woke to Work framework from Equity in the Center to ground the work, the audit involved three main focus areas: a) conducting an historical analysis of CAISE work to date (including compiling a database of all participants in CAISE activities from the first award period until present); b) examining CAISE operations and processes; and, c) reflective assessment of the 2021 Awardee meeting. While the audit activity took place during the final two years of the third award period, evidence of its impacts can be seen in the Awardee Meeting documentation and the meeting's summative evaluation report. As of the submission of this article, dissemination of the equity audit findings and outcomes are ongoing at ISE and SciComm conference sessions and meetings.

REFLECTIONS ON IMPACT
I think overall, CAISE has helped ISE become a field. That systematic building on each other's ideas in a field that doesn't have so many great venues for publication has been really important. - an NSF AISL-funded principal investigator with 10 years of experience in the field.

In the fifteen years since CAISE was initially funded, the resource center and the field of informal science education, often now referred to as informal STEM learning, have co-evolved. Throughout the three award periods, CAISE has endeavored to provide access to the most recent findings from scholarship, evaluation and practice; to create, research, and share resources to inform collaborative, equitable work; to track and reflect areas of activity and growth; and to regularly update the professional community on opportunities for funding support and professional learning.

Assessing CAISE's impact on these areas of activity is a complex task for which CAISE has engaged Inverness Research (IR) as an external evaluator. From the beginning, IR's approach has been to interrogate what it means to grow and strengthen a field, what it means to be a "center," and what the impacts are of an investment in infrastructure. Inverness drew on the The Bridgespan Group's *Strong Field Framework* released in 2009 for theoretical grounding, and attended, observed, and/or monitored CAISE activities, interviewed participants, and surveyed NSF ISE and AISL program awardees and the ISE field writ large at strategic junctures in CAISE's trajectory.

Over time IR found that the "four C's" of CAISE's theory of action- i.e., convening, connecting, characterizing, and communicating- were overlapping and mutually reinforcing. For example, convening professionals from across the ISE field facilitated connections among them and their work. Making connections made it possible for

CAISE to characterize strands of work and communicate more widely about what was being learned. Concurrently, project teams' contributions of findings to the community repository on InformalScience.org expanded CAISE and NSF AISL program knowledge about areas of work that are connected.

In parallel CAISE has monitored web analytics for the InformalScience.org website and the repository that has grown to include 9000+ resources. Among the types of materials and pages that are most visited and accessed are CAISE-created and/or curated resources and tools for understanding and using evaluation and research in the design of projects. Also popular have been the Knowledge Base articles that synthesize and characterize knowledge gained from designing, researching, and evaluating ISE projects in a variety of settings, with a variety of audiences. Other frequently-accessed individual tools and documents include the *Framework for Evaluating Impacts of Informal Science Education Projects* report, the *Broadening Perspectives on Broadening Participation* report and toolkit, the CAISE video interviews on STEM identity, interest and engagement, and the Year in ISE slide decks. Of the early Inquiry Group reports, the *Public Participation in Scientific Research: Defining the Field and Assessing its Potential for Informal Science Education* white paper has continued to be the most cited, as the citizen science community has evolved and grown. InformalScience.org pages on finding funding, blogs with lists of recent AISL-funded projects, and pages with general information about the NSF AISL Program and solicitations also receive lots of traffic, especially in the months leading up to proposal deadlines. With regard to the 4 C's of CAISE's theory of action, a few observations stand out:

Convening:
The community's overall satisfaction with how CAISE has conducted AISL PI and Awardee meetings steadily increased since 2010 as evaluation results informed iterative planning with the AISL program. While the virtual nature of the 2021 Awardee meeting created some challenges and frustrations for participants and CAISE, as they have for so many others conducting similar meetings, it also provided unprecedented opportunities for broader and asynchronous participation, as well as timely, thorough documentation.

Connecting:
It is impossible to know all of the connections among ISE and SciComm professionals and others that CAISE has facilitated over the years. That said, 86% of respondents to the 2019 AISL PI Meeting survey reported that CAISE activities or events have created connections that led to collaborations or professional, mutual-learning opportuni-

ties, a finding that is echoed in data collected from other CAISE events. CAISE task force members reported that a major benefit of their participation was the professional connections they made to a broader array of networks and organizations in other fields. The success of CAISE's efforts to connect related areas of ISE and SciComm work is reflected in the increasing number of professionals who identify as "boundary spanners'' and who are invited or choose to participate in conferences, meetings and symposia across the wider community.

Characterizing:

CAISE has solicited and/or written hundreds of blogs and project Spotlights that share findings, lessons learned and themes that arise in the implementation of ISE work, crowdsourced or curated 74 articles in the Knowledge Base, and sought out and curated literature reviews for inclusion in the community repository. Analytics have shown that these types of syntheses are more frequently accessed than individual articles or papers.

Communicating:

CAISE expanded its communication channels during the third award period to post daily on Twitter, where it garnered 4,499 followers and has had 1,870,000 tweet impressions (engagements with tweets) since opening the account. The CAISE Newsletter 32% open rate has been consistently higher than the education industry average of 28.5%, and 58% of the summative evaluation survey respondents reported accessing CAISE communication channels to stay current on developments and opportunities in the field.

Overall, in terms of field-building, the ISE field continues to grow by varying degrees along the dimensions of shared identity, standards of practice, knowledge base, leadership and grassroots support, and funding and supporting policy- components outlined in *The Strong Field Framework*. There are now more professional associations, networks, and resource centers who support ISE-related work by creating resources and providing forums than there were when CAISE began its work.

CAISE has particularly focused on supporting an evidence-based **standard of practice**, **engaging leaders who are dedicated to advancing the field**, and developing a rich, accessible **knowledge base**. More indirectly, others, such as ISE and SciComm professional associations have used what CAISE has collected, characterized, and communicated to advocate for and gain support for the field's place in the larger STEM education community ecosystem. Increasingly, science or STEM **engagement** has also become an umbrella term for a wider community that is inclusive of informal STEM education and science communi-

cation, a development that CAISE has worked to advance. It is CAISE's hope that going forward the convergence of STEM engagement, education, learning, and communication will continue to result in knowledge and capacity-building and an ever-growing sense of **shared identity**.

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Using Near-Peer Subject Matter Experts in Library Programming: Part I

By Stephanie Vierow-Fields, Carrie Liston and Sky Reid-Mills

This is the first part of a two-part series about the use of undergraduate and postgraduate students from NASA-funded universities as Subject Matter Experts in public library programming.

INTRODUCTION

Public libraries, once seen as quiet places of independent learning, have become areas of messy creativity and loud exploration. Libraries have embraced the concept of "do it all" learning, and opened the gates for their communities to interact, investigate, and discover in new and exciting ways. Much of this new focus has been on increasing programming in STEM (Science, Technology, Engineering, and Math) or STEAM (with the added "A" for Art).

While STEM programming is prominent in informal learning environments such as museums or science centers, many public libraries still view STEM programs as a new, and often daunting, challenge. Most library staff members do not have an educational background in a STEM field and have reported feeling uncomfortable providing programming around unfamiliar topics (FINAL_STEM_LibrarySurveyReport.Pdf, n.d.). The NASA@ My Library project seeks to address this challenge by providing 60 public libraries across the country with regular trainings and access to NASA informational resources. While the formal learning outcomes of NASA@ My Library are aimed at familiarizing diverse communities with a variety of NASA STEM concepts, the project takes seriously the need to support library staff in their own understanding of STEM topics and giving them the tools to create a fun learning environment, suitable for a public library. One question the project team asked was how do we support library staff on these complex STEM topics, such as NASA science, while still creating a fun learning environment to fit a public library program (or to attract/engage a public library audience)?

One way we sought to address this need was the introduction of "near peer" Subject Matter Experts (SMEs). These were university students in STEM or STEM education majors recruited from NASA funded universities, with "near-peer" referring to their being within a generation of current youth patrons at public libraries.

This paper explores how NASA@ My Library utilized these university students as near peer Subject Matter Experts (SMEs) to aid library staff with their NASA STEM programming, while also giving younger library patrons the ability to interact with students like themselves who are pursuing careers in STEM fields at the university level. Additionally, we will discuss why SMEs are important in library settings, the challenges of using a STEM professional as a SME, how NASA@ My Library developed and piloted a model to use near peers as SMEs, what the SMEs' library programs looked like, and the experiences of student SMEs and library staff with the model.

OVERVIEW OF THE NASA@ MY LIBRARY PROJECT

Through the NASA@ My Library project, NASA, 60 public libraries, state library agencies, and five universities work together to generate STEM learning opportunities for millions of library patrons throughout the nation. NASA@ My Library is made possible through the support of the National Aeronautics and Space Administration (NASA) Science Mission Directorate (SMD) as part of its STEM Activation program. The project is designed to promote access to NASA scientific discoveries, provide learning opportunities to persons of diverse backgrounds, and to create access to local programs, STEM tools, activity kits, and other resources that public libraries may not have easy access to. Librar-