21st Century Museum Professionals

Sample Application 21MP-258337-OMS-25

Sciencenter Discovery Museum

Amount awarded by IMLS:	$499,655
Amount of cost share:	$499,884

The Sciencenter, in partnership with the National Informal STEM Education Network, proposes a professional development project for museum practitioners in service of early childhood learning. This three-year project will engage 30 pairs of museum practitioners and local community partners in six-month professional learning communities to increase their capacity to provide relevant family engagement in STEM for all audiences. Museum-community partner pairs will collaborate within a cohort of their peers to plan, develop, and implement early STEM programs while growing a reciprocal partnership. This project will build field-wide capacity to address early childhood needs by strengthening local partnerships and connecting museums with effective, evidence-based resources. Online workshops and a digital toolkit will be made widely available to reach additional practitioners and enrich early childhood and family learning across the museum field.

Attached are the following components excerpted from the original application.

- Narrative
- Schedule of Completion

When preparing an application for the next deadline, be sure to follow the instructions in the current Notice of Funding Opportunity for the grant program and project category to which you are applying.

NARRATIVE

Sciencenter

Network for Early STEM Learning (NESL) – Supporting Early Learning through Field-wide Resources

The Sciencenter, in partnership with the National Informal STEM Education Network (NISE Network) at Arizona State University (ASU), proposes *Network for Early STEM Learning (NESL) – Supporting Early Learning through Field-wide Resources,* a three-year professional development project that seeks to empower museums and museum practitioners to support science, technology, engineering, and math (STEM) process skills and learning for young children.

I. PROJECT JUSTIFICATION

Project Need: There is broad consensus amongst national leaders that STEM literacy is critical to success in our society and economy (World Economic Forum, 2022). In their 2021 Call to Action for Science Education, the National Academies stated that "scientific thinking and understanding are essential for *all people* navigating the world, not just scientists and other STEM professionals." As U.S. policymakers and education officials rally the STEM community to urgent and collective action on this growing public need, researchers and educators have called for a greater awareness of the importance of introducing STEM learning as early as possible (Clements et al., 2021; Dejarnette, 2016). Young children, ages 0-5, are naturally curious and capable of developing STEM concepts and skills, even as babies (Tippett & Milford, 2017). Research shows that early experiences in STEM can enhance children's science learning in later grades, lessen gender and socioeconomic gaps in science, and foster interest – a critical factor in predicting future participation in STEM later in life (Leibham et al., 2013; Renninger & Hidi, 2016; Waldfogel & Zhai, 2008). It also offers general benefits to intellectual and linguistic development, creativity, and strengthening executive functions (Wenner, 2022) while contributing to overall school readiness (Larimore, 2020). Integrating STEM in early childhood education isn't a new approach (especially among museums and other informal learning practitioners), but it's gaining momentum as a foundational element in developing well-rounded learners (McClure et al., 2017a). Despite the growing demand for early STEM education, many parents and educators do not feel equipped to offer high-quality hands-on STEM learning for young children, experiencing anxiety and low self-confidence (McClure et al., 2017b).

Science and children's museums play an important role in addressing these challenges. Researchers and educators have long recognized that preschool-aged children learn best in informal settings where they can interact with hands-on activities, learn through play, and have important interactions with caregivers (Eberbach & Crowley, 2017; Jant et al., 2014). Museums excel in supporting lifelong, intergenerational STEM learning for diverse public audiences (Maldonado & Nguyen, 2020). Over the past decade, many early childhood organizations like Head Start have begun looking to their local science centers and children's museums to help better prepare their teachers to facilitate early STEM learning (Kortenaar, 2017; Svarovsky, 2019). Supporting early educators and young children is even more urgent now in light of the numerous impacts of the COVID-19 pandemic on children's social, emotional, and educational development (Blad, 2022; Dorn et al., 2020). Unfortunately, many museums are still dealing with the shockwaves of this crisis themselves, including the need to restart programs that were put on pause and to provide training for new staff (AAM, 2023).

This project aims to support museum practitioners in navigating these challenges and responding to the need for early STEM learning in their communities. Even without these challenges, some museums simply don't know where to begin; others are struggling to maintain momentum and build on the success of existing early childhood programs. There remains a significant need for high-quality professional development to help museums integrate early STEM learning throughout their programs, exhibits, and community partnerships. The proposed project addresses three key needs of the current museum workforce: 1) in-depth peer-to-peer training for committed professionals to support early STEM learning within their communities, 2) resources to build and sustain partnerships with community-based organizations to develop equitable programs, and 3) an ongoing learning environment to support and foster this work.

Relationships to prior work*:* The Sciencenter has experienced these needs firsthand. In 2013, the local Head Start agency, Tompkins Community Action (TCAction), asked the Sciencenter to help strengthen teacher preparedness in science. Back then, there was little guidance within in the field for building an effective educator-training program. While many museums worked with Head Start, few provided teacher training, and there was little consistency or sharing of best practices. More importantly, we lacked a professional community to collaborate and learn with. These experiences led to the creation of the Sciencenter-led *Collaborative for Early Science Learning* (CESL). This IMLS-funded project (2015-2018) supported six museums from across the country in designing best practices for museum-facilitated early science training for Head Start teachers – resulting in the dissemination of field-wide resources (see attached *CESL Evaluation Summary*, Supporting 1.2). Since then, the Sciencenter's early STEM offerings have continued to evolve and improve

through our partnership with TCAction, bolstered by institutional capacity building in practices to sustain equitable partnerships (e.g., using community-centered approaches like co-development). In that time, we have continued to share insights and experiences with the museum field through evaluation reports, conference sessions, and *MuseumTools.org* – a digital repository of hands-on activities, professional development materials, and guides for engaging children ages 0-5 in STEM. Due to this work, many museums now recognize the Sciencenter as a field-wide leader in early STEM learning.

Science and children's museums also recognize the NISE Network as a trusted asset and leader in the field of informal learning. The NISE Network is a community of informal educators and scientists from 350+ institutions across the US, dedicated to supporting STEM learning. Their work advances the field by incorporating current science into museum exhibits and programs, improving the practices and skills of educators and scientists, and creating lasting, valuable relationships among individuals and organizations. A study on organizational change examined the NISE Network as a *community of practice* and found that participating museums were able to use Network resources to improve public offerings, practices, and partnerships (Beyer et al., 2017). "Communities of practice" establish shared goals, develop relationships, and collaborate on practices and resources (Wenger, 1998). Network professional development programs and learning communities – like those proposed in this project – are novel and regarded as "especially valuable" amongst museum practitioners. They allow professionals to learn from their peers' work, network with "position alike" staff from other organizations, and workshop practical program ideas (see attached *SEISE Evaluation Summary,* Supporting 1.1).

The Sciencenter and project partner ASU are lead institutions in the NISE Network. They have previously facilitated and participated in numerous Network-coordinated professional learning communities for museum practitioners. Recent examples include those offered through the IMLS-funded *Sustainability Fellowships* and the NASA-funded *Making Earth & Space Inclusive and Relevant* projects. Notably, museum professionals from each of these intensive NISE Network professional development programs requested additional support in adapting STEM activities for early childhood.

Professional learning communities (PLCs) have grown in popularity within the museum field as effective and desirable mechanisms for sustained professional development. PLCs are groups that choose to meet regularly with the intention of improving their skills and knowledge through collaborative learning, expertise exchange, and active discussions. PLCs address practitioner calls for professional growth opportunities that offer mentorship and peer support (Tran et al., 2019). Collaborative learning environments are especially critical when seeking to bring equity and inclusion into educators' practice, which is essential to the proposed project (Tran et al., 2013). The PLC model lowers barriers to participation, helping engage diverse practitioners, including those from under-resourced museums (Swanson, 2018). It also encourages a *community of practice* – a framework for building professional capacity, which has become popular in other educator networks beyond the NISE Network (Anderson et al., 2022; Weller & Ostman, 2021), including Head Start (Boonstra et al., 2023). The Sciencenter is experienced in this framework and currently leads a 12-museum community of practice on the NASA-funded Learning Ecosystems Northeast project, which focuses on building youth climate and data literacy using connected learning ecosystems and partnership-centered approaches (Gulf of Maine Research Institute; #NNX16AB94A). The proposed project will leverage the Sciencenter and NISE Network's significant prior successes in using museum PLCs and communities of practice to make STEM content more relevant and inclusive.

Addressing Program Goals: *Network for Early STEM Learning* aligns with Goal 1 of the IMLS 21MP program by providing evidence-based professional development for current museum practitioners focused on early childhood development and learning. This project will develop a new professional development program that supports the museum workforce in engaging early learners in informal STEM education (21MP Objective 1.1). Providing museum staff with ongoing training in child development and informal and interactive learning is of deep importance to the museums and is cited by the Association of Children's Museums (ACM) as a "standard for professional practice," critical to enhancing visitor play and learning in museums (ACM, 2022). Using the national reach of the NISE Network to engage museums and community organizations in peer-to-peer learning that benefits their local communities directly aligns with IMLS's overall goal to champion lifelong learning. This timely project also addresses some of the unique workforce challenges that museums face in this post-pandemic environment. In recent years, the museum workforce has undergone significant turnover, including the retirement of many seasoned colleagues (Benoit-Bryan et al., 2023; Merritt, 2021). This project is an opportunity to connect newer museum practitioners with effective, evidence-based resources and surround them with peers and mentors who can support their learning and growth. Seasoned practitioners will also benefit through reflection on their practice and the focus on early childhood – an audience that many museum professionals have requested assistance in reaching (O'Neill et al., 2023). Museums throughout the United States will benefit from the opportunity to rebuild and strengthen partnerships in their community that may have waned during the pandemic or begin new collaborations in response to the growing post-pandemic need for early STEM learning support.

Benefits to the Museum Field: This project will have a strategic impact on the museum field by advancing knowledge and sharing evidence-based practices with practitioners and communities across the country. The proposed professional development activities will support museums in meeting a pressing need to offer more relevant and desirable professional growth opportunities for their staff (NRC, 2015; Tran, 2019). Research suggests that what practitioners need is not just "more resources" (e.g., curricula, activities, or guides) but rather more opportunities to engage with existing quality resources in a collaborative learning environment of peers. Most museums are unable to afford the luxury of institutionalized internal training models that offer ongoing collaborative, reflective growth opportunities (Swanson, 2018; Tran et al., 2019). Instead, they tend to offer *traditional* professional growth activities like "shadowing, one-off training, and individual conferences," which can leave practitioners feeling isolated and burdened in attempting to adapt their practice without mentorship or peer support (Tran et al., 2019). Museums can retain and develop committed practitioners by offering them opportunities to participate in this project's professional learning cohorts. With applications and demand always exceeding the number of available places in prior NISE Network professional learning communities, it is clear that our field needs this investment in creating new peer-to-peer learning environments to support our practice.

This is especially the case for early childhood professionals in science museums. As the Sciencenter experienced when starting our early childhood work – despite significant interest amongst science centers and children's museums to offer more early STEM experiences as a key component of informal, free choice education – opportunities for professional development in this area are limited. This project's emphasis on early childhood STEM will help museums instill best practices and strengthen local networks to sustain broad, long-term integration of STEM in early learning while overcoming misconceptions about who is capable of *teaching* and *learning* STEM (Yang et al., 2022). This project will emphasize STEM process skills that are developmentally appropriate for children ages 0-5 (i.e., observing, inquiring, measuring, identifying patterns, making predictions, etc.) and that apply across a range of STEM content areas.

The proposed project will also support museums in meeting their educational goals, especially around diverse engagement. Recently, museums and other informal learning professionals have engaged in field-wide conversations to reflect on and redefine our strategies for *broadening participation in STEM*. Despite best intentions, inequitable practices in museum science learning still exist, serving to *exclude* rather than *engage* children of color (Dawson, 2014). There is significant professional interest in *critically reimagining* the ways we design museum learning experiences to identify and disrupt factors that are creating inequities in participation (Garibay & Teasdale, 2019). Museum and community partnerships rooted in equity can transform informal learning practices. Prior partnerships between museums and community-based organizations have been most successful when individual expertise is recognized and shared for mutual impact: experience in STEM pedagogies (often from museum staff) and strategies for culturally relevant engagement (often from community partners) (Beaumont, 2017; Todd et al., 2017; Anderson et al., 2022; Ostman et al., 2022). This project will create a professional learning community for museums and community-based early childhood partners (e.g. Head Start, childcare centers, etc.) to reflect with peers, develop equitable programs, and foster relationships that support and sustain inclusive early STEM learning in their communities.

Target Group and Beneficiaries: The target audience is practitioners at museums and community-based organizations. Project activities will reach practitioners at thirty (30) different museums across the United States and the thirty (30) community-based organizations that partner with them in professional development. The program will be open to existing NISE Network partners as well as museums that are new to the Network. Participants will be selected through a widely publicized, competitive application process. We estimate that participant demographics will be similar to those of the most recent NISE Network professional learning community (i.e., *Sustainability Fellowships 2021-2022*):

- *Geographic distribution:* nationwide participation by museums across the U.S. states and territories
- *Community type:* rural (13%), suburban (10%), small urban (27%), mid-sized urban (21%), large urban (28%)
- *Museum type:* science center or science museum (47%); children's museum (27%); botanical garden, public garden, or nature center (13%); natural history museum, history museum, or culture museum (9%), zoo or aquarium (4%)

The project team is prepared to support engagement with diverse audiences of "practitioners." Museum *practitioners* could include educators, exhibit designers, leadership, and other museum professionals. Community-based *practitioners* are expected to come from a variety of early childhood backgrounds and professions, for example, early childhood educators, Head Start teachers, childcare providers, or childcare coordinating councils.

Museum practitioners from the NISE Network and early childhood educators from TCAction have participated in designing the proposed work plan and project objectives to reflect field-wide needs and priorities. Similarly, we have incorporated practitioner feedback from program evaluations of both prior NISE Network professional learning communities and Sciencenter early childhood collaborations with local partners, including TCAction.

The beneficiaries of this project are museum practitioners, community-based partners, families, and young children (ages 0-5). In addition to the 60 participants in the professional learning cohorts, we anticipate that this project will reach an additional 300 museum and community-based practitioners through dissemination activities in Year 3. We estimate that at least 1,500 children and caregivers will benefit from the early STEM programs implemented by museum-community organization pairs during the project period.

The project will benefit populations historically underrepresented or underserved in STEM by building upon existing early child development programs, including Head Start, that are already committed to equity and creating opportunities so that children from low-income families can thrive; these existing programs value parental involvement and enhancing the cognitive, social, and emotional development of young children. Participating museums will work alongside equity-focused early childhood organizations in their own communities to engage diverse audiences from a young age.

II. PROJECT WORK PLAN

The proposed project will carry out a variety of professional development activities designed to reach museum professionals at multiple levels throughout the field. The Project Team will carry out four overarching areas of work, including 1) developing a digital resource toolkit for museum practitioners; 2) providing in-depth peer-to-peer professional development for museum practitioners through a professional learning community with community-based organizations; 3) conducting evaluation and tracking performance measures, 4) disseminating project resources beyond the community or practice to reach museums practitioners field-wide. These activities will occur over three years, from July 2025 to June 2028 (see attached *Schedule of Completion* for a detailed overview).

Toolkit Development*:* The project team will begin by developing a prototype toolkit of resources that provides museum practitioners with relevant and actionable tools to integrate STEM into early childhood education. The toolkit will include 1) equitable partnership guidance, 2) a suite of hands-on early childhood STEM activities, and 3) a framework for how early STEM learning supports interest and engagement. The project team will leverage existing evidence-based practices and activities from the Sciencenter's early STEM programming. These resources have previously been tested in other museums and refined for use by museums in diverse communities across the nation (see Supporting 1.2 and NSF #DRL2005594). Additional input and resources will come from the collective expertise of the core team, the NISE Network's extensive collection of existing resources, and project advisors from the fields of early childhood research, education, and practice (see attached *Letters of Commitment*, Supporting 2). The toolkit will be designed as a practical resource for museum practitioners, not an exhaustive resource. Participants in the professional learning cohorts will *use the toolkit as a resource* for their own training and development while also providing feedback to *help enhance the toolkit* for broader use within the museum field. The final toolkit will be translated into Spanish in Year 3 before publishing.

Professional Learning Community: Supported by the NISE Network at ASU, the project team will recruit and engage two cohorts of a professional learning community focused on early STEM learning, providing 30 pairs of practitioners from museums and community organizations with in-depth, peer-to-peer professional development. Each sequential cohort ("A" and "B") will participate in a six-month peer-to-peer professional development program followed by an implementation period. During this program, museum practitioners and their community-based counterparts will attend weekly virtual gatherings led by the project team, where they learn to implement the framework, partnership practices, and early STEM learning activities outlined in the toolkit. Participating pairs will receive take-home materials and action steps to encourage asynchronous collaboration outside of cohort meetings. Each participant pair will also be responsible for co-leading an early STEM program that addresses needs in their community, including training other staff from their home institutions. Examples of possible programs include museum family engagement events, daycare activities, rural outreach, and/or teacher professional development. Cohort graduates will receive ongoing implementation support through the end of the project, including opportunities to discuss challenges and share promising practices and innovations from their work. This ongoing *community of practice* will be supported by the NISE Network and include dissemination through online workshops, blog posts, and NISE Network check-ins at annual museum conferences, including ACM.

Cohort A will serve as the test cohort, starting at the end of Year 1. The project team has already invited five museums to participate in Cohort A: *Arizona Science Center* in Phoenix, AZ; *Children's Creativity Museum* in San Francisco, CA; *Children's Museum of Houston*, TX; *Children's Museum of Pittsburgh*, PA; and *Discovery Lab* in Tulsa, OK (see Supporting 2). These five sites were carefully selected to ensure that Cohort A is a representative sample of our diverse museum field, reflecting a variety of staff sizes and demographics, geography, and primary audiences. The smaller cohort size will allow for multiple rounds of iterative testing to inform core improvements to the toolkit prototype. It will also offer the project team the flexibility to adjust the program in response to participant feedback. A formative evaluation of Cohort A's experience, led by the external evaluator, will be used to enhance the program prior to scaling.

Cohort B will scale the approach, reaching 25 additional museum-community organization pairs in Years 2 & 3. Participants will be recruited using a competitive and transparent application process, open to all museums (using the IMLS definition). Selection criteria for successful museum application sites will include a) existing experience (or proven interest) in serving children ages 0-5 and their families and b) the identification of an early childhood community partner. The project team will select participant pairs that reflect a range of partnership styles and maturity, geographic locations, audience demographics, and organizational diversity. Ultimately, the project team will select organizations that are best prepared to accomplish IMLS and project goals. The project team will coordinate with the NISE Network and advisors to publicize the cohort opportunity widely, review applications, and make awards.

Evaluation: The project's external evaluator, the Museum of Science, Boston Research and Evaluation Department (MOS), will support the project team in collecting ongoing feedback from participants about professional development activities and resources (see attached *Evaluation Plan*, Supporting 3). MOS will work with the Sciencenter to design appropriate tools for formative and summative data collection, including surveys, pre- and post-program interviews, and other ways to capture feedback from participants. MOS will train project staff in data collection methods as necessary and support the project team by analyzing project data to inform iterative program changes. Cohort participants will also receive support from MOS in using evaluator-led Team Based Inquiry (TBI) as a practical evaluation tool to collect data from program participants and reflect on those findings. TBI is a process developed by the NISE Network as a practical approach to empowering education professionals to get the data they need, when they need it; to improve their products and practices; and ultimately, engage audiences more effectively (Pattison et al., 2014). MOS's expertise will enhance the project team's aptitude for evaluative thinking and increase their capacity to adjust the professional learning cohort and toolkit based on participant feedback. MOS will summarize their findings in a final Evaluation Report, aiding the Sciencenter in monitoring progress toward achieving the intended results and offering insights for future growth.

Dissemination: The results of the project will also be disseminated beyond the professional learning cohorts, reaching hundreds of museum practitioners throughout the NISE Network and beyond, including early childhood researchers and early childhood community-based practitioners. Starting in Year 3, the NISE Network will share a high-level overview of cohort insights and innovations more broadly, hosting field-wide online professional development workshops and communicating with museums through the NISE Network newsletter and blog posts. These workshops will be appropriate for any professionals who did not participate in one of the cohorts (including other staff from participating museums). They will be widely publicized through free online listservs, social media groups, and other communications frequently used by museum professionals. The final toolkit will also be distributed as a digital resource on the NISE Network website (*nisenet.org*) and *MuseumTools.org*. In-depth iterative workshopping of the toolkit with 60 practitioners across 30 communities will enhance the relevancy of those resources to support museum practitioners nationwide across a variety of local contexts. The project team will attend the Association of Children's Museum annual InterActivity Conference – supporting recruitment and incorporation of emerging best practices in Years 1 and 2 and presentations, breakout sessions, and other dissemination activities in Year 3. Finally, the activity guides, evaluation insights, and other project resources will be disseminated to early childhood practitioners through existing networks like Head Start and ZERO TO THREE to further support implementing family STEM engagement in early learning. Planned publications will reach researchers in the field of early childhood development and mobilize knowledge between research and practice.

Project Risks: As with any professional development project for museum staff, there is the risk that the proposed program does not meet the intended learning and implementation objectives. The project team is mitigating this potential risk by using an existing program model that has been implemented, evaluated, and iteratively improved through previous professional learning cohorts run by the NISE Network. Similarly, this project *draws on research-backed* early childhood frameworks, NISE Network tools for equitable partnerships, and activities that are proven to be effective in informal contexts and introduces them to practitioners in a *peer-supported environment*. Furthermore, this collaborative environment will support museum-community partner pairs in navigating any unexpected challenges and help ensure that relationships and outcomes are truly equitable, and represent and meet the needs of diverse local communities. The Sciencenter and TCAction can serve as a powerful example and mentors to participants, with over a decade of practical experience collaborating on early childhood research, practice, and education. Another risk in this national professional development project is that the team will lack the knowledge, relationships, and infrastructure to successfully implement a program of this geographic scale and navigate unexpected challenges. This potential risk is mitigated by the longstanding professional relationship between the Sciencenter and the NISE Network and the significant experience held by the NISE Network in partnering with museums to implement field-wide museum professional development initiatives (including online cohorts). The NISE Network also has robust management and communications systems to support museum involvement (Alexander et al., 2010). A final risk is that the model and learnings from the cohort will not be disseminated

widely or taken up by other organizations after the funded project period. This potential risk is mitigated by the proposed dissemination plan, which leverages multiple networks where professionals already seek resources, such as the NISE Network and professional associations like ACM. The products disseminated through this project will be vetted, practical, ready-to-use tools that are applicable to a broad range of professionals and organizations.

Project Planning, Implementation, and Management: The project will be carried out by the Sciencenter and NISE Network staff at ASU, led by *Ali Jackson*, Director of Programs and Partnerships, Sciencenter. Additional expertise and accountability will be provided by TCAction, external evaluators from the Museum of Science, Boston, and a panel of advisors (see attached *List of Key Project Staff and Consultants*). Jackson will oversee the design and implementation of professional development activities. Jackson has extensive experience directing multi-partner projects at a local and national level, including leading the development of informal STEM education resources NISE Network. She also oversees the Sciencenter's education department and our extensive work with local community partners, including TCAction. Additional members of the core Sciencenter Team include *Michelle Kortenaar*, Executive Director, who directed the 2015 CESL project and helped initiate the Sciencenter's work with Head Start; *Annie Gordon*, Education Program Manager, who plans and facilitates most of the early STEM learning at the Sciencenter; and *Caroline Frigon*, Education Program Manager, who supports our early STEM programming and coordinates Sciencenter involvement in national collaborative projects. Gordon and Frigon's ongoing experience with early STEM learning and providing teacher professional development will enable them to plan and facilitate impactful learning and peer support for the museum-community organization pairs participating in the cohort, along with input from our local community partner, TCAction. Kortenaar's long history with early STEM learning at the Sciencenter and in museums will help sustain relationships with core partners and advisors. NISE Network participation will be coordinated by *Catherine McCarthy*, a senior program manager for the NISE Network at ASU. McCarthy will support recruitment, dissemination, and coordination of effective communication with staff at NISE Network partner museums. *Michelle Blodgett*, Director of Family Services, will coordinate TCAction's support during toolkit development and within the professional learning community. *Allison Anderson* will oversee MOS's role as the lead evaluator and assist in project tracking and performance measurement.

The members of the project team have significant prior experience working together on prior national collaborative projects and, as a result, have well-developed systems for collaborating and communicating within the team, soliciting and responding to participant feedback, and tracking progress and performance. The Sciencenter, NISE Network, and MOS have previously collaborated on several past NISE Network professional development projects. Jackson and McCarthy also have direct experience developing and leading prior professional learning communities. TCAction not only collaborates with the Sciencenter on ongoing early STEM programs, they were also a core partner on the *Collaborative for Early Science Learning* project, and along with project advisors, are actively involved with Head Start and other regional, state, and national early childhood networks.

The Sciencenter has also gathered a panel of advisors with experience as researchers and practitioners in early childhood education and museum professional development (see Supporting 2). Advisors include *Dr. Maureen Callanan*, Professor of Psychology, University of California, Santa Cruz; *Dr. Marianella Casasola*, Professor of Psychology, Cornell University; *Dr. Erin Jant*, Assistant Professor of Psychology, Western Kentucky University; *Dr. Rae Ostman*, Director, National Informal STEM Education Network; *Rebecca Parlakian*, Senior Director of Programs, ZERO TO THREE; *Dr. Scott Pattison*, Research Scientist, TERC; *Jennifer Rehkamp*, Director of Field Services and Research, ACM; and *KT Todd*, Director of Learning and Research, Children's Museum of Pittsburgh. These advisors will provide outside input and support for project activities relevant to their areas of expertise.

Allocation of Time, Finances, Personnel, and Other Resources: The project budget is $999,347, with $499,038 requested from IMLS and $500,309 contributed as cost-share in the form of staff and advisor time, cohort participant support, in-kind support for Sciencenter early learning programs, and indirect costs. Museums and community organizations that participate in the professional learning cohorts will receive modest participant support funds and the full toolkit of resources to support their learning and implementation. In addition to budgetary resources, we will also rely on expertise from the core project team as described above, and in particular, the Sciencenter's expertise in early STEM learning. For nearly 15 years, the Sciencenter has provided teachers with professional development that supports early childhood educators throughout their career trajectories, including ongoing workshops, a peer-to-peer learning community, and mentorship in planning and facilitating hands-on STEM learning. This training has primarily benefited local educators from the Tompkins County Head Start and Early Head Start agencies and rural networks of Pre-K-12 educators. This project will also leverage existing NISE Network relationships and communication channels with 350+ member museums to broadly disseminate professional development resources and recruit participants for the professional learning community. All of the necessary videoconferencing and recording services for the professional learning

community and dissemination workshops are available through ASU (see *ASU Facilities & Equipment*, Supporting 1.5).

Tracking Progress: Tracking and evaluation will be supported by the external evaluator, Museum of Science, Boston, led by Anderson. Our evaluation plan (see Supporting 3) includes questions, protocols, and methods designed to track performance measures throughout the project. Formative data collection will provide the project team with continuous feedback from museum and community-based practitioners to inform iterative and continuous improvement of project activities. A summative evaluation of Cohort B will be conducted to measure progress toward achieving the intended results. Specific tools for data collection may include pre/post surveys, interviews, and analysis of cohort artifacts. Evaluators will serve as mentors to the project team, helping create instruments, develop protocols, and guide analysis for the project team. Each museum-community organization pair will submit an implementation report 4-6 months after the cohort, providing general participant feedback and basic information from participants about the impact of project activities on secondary beneficiaries, including families and young children in their communities. Periodic written summaries of front-end and formative evaluation findings will provide timely and actionable data for tracking and reporting progress. The summative evaluation will be documented in a formal report.

III. PROJECT RESULTS

The overarching goal of this project is to empower museum and community practitioners with the knowledge and support to meet the significant interest for early STEM learning in their communities. The intended outcome for the target audience of museum and community practitioners is that they will develop and sustain reciprocal partnerships that enrich early childhood and family learning through hands-on experiences with STEM.

As a result of participating in the project's professional learning communities, *museum and community practitioners* will increase their: 1) confidence in their ability to engage young children in STEM activities; 2) capacity to establish equitable community partnerships that support early childhood and family learning; and 3) access to and use of evidence-based principles, practices, and professional resources in early learning (see attached *Logic Model*, Supporting 1.3). These learning objectives are based on factors that promote professional learning and equitable learning (Beyer et al., 2017). We also anticipate outcomes for secondary beneficiaries: *young children* will improve STEM process skills and interest in STEM topics, and *families* will have increased capacity and confidence to encourage STEM learning with children.

Tangible Products: This project will result in a digital toolkit that offers museum practitioners everything they need to start developing or enhancing STEM learning for young children in their community. Toolkit contents will include 1) an evidence-based framework for how early childhood STEM learning supports relevant family engagement and interest, 2) exemplar activities, 3) promising case studies from cohorts, 4) tools for museums to develop and strengthen equitable community partnerships, and 5) professional development materials such as slides, videos, or guides that can be used to engage staff across a museum. This toolkit will be provided to cohort participants but will also be appropriate for museum practitioners who did not participate in the cohorts (including other staff in participating museums). It will be made available as a free, open-source resource on *nisenet.org*. Products resulting from the robust dissemination plan will also be available for future reference on *nisenet.org*, including recordings of the online professional development workshops, slides from conference presentations, and any share-out materials from the professional learning cohorts. Information on project results will be published in field-wide publications, post reports on *nisenet.org* and the REVISE center for the informal STEM education field (*informalscience.org*), and other free repositories. Cohort participants will also be encouraged to present their practices and implementation projects at conferences and through publications.

Sustaining Project Benefits: This project contributes to long-term, national efforts to increase community-level science literacy and foster intergenerational science learning. By building museum practitioner expertise, fostering a vibrant professional learning community, and strengthening museums' partnerships with early childhood organizations in their communities, this project better equips museums to provide early childhood STEM programs as a key component of informal, free-choice education. Participating museums and professionals will have an increased capacity to initiate and sustain reciprocal partnerships with organizations that serve diverse youth in their community, enabling them to better support relevant and inclusive family engagement beyond this project. Community partner participants will also benefit, through increased ability to engage children and families in STEM. The supportive environment created by the project's PLCs will strengthen relationships between museum-community organization pairs and among museum professionals and allow diverse professionals to learn from each other. Sustaining these relationships would prolong the two-way exchange of cross-field knowledge and expertise and could help institutionalize and sustain practitioner training well beyond the project period. Ultimately, federal investment in this project will better equip the museum field to respond to national calls to ensure that all Americans, even our youngest learners, have lifelong access to quality STEM education.

Schedule of Completion

Network for Early STEM Learning (NESL) – Supporting Early Learning through Field-wide Resources

PROJECT YEAR	**YEAR 1**						**YEAR 2**						**YEAR 3**					
Calendar Year	**2025**		**2026**				**2027**						**2028**					
	July 1, 2025 - June 31, 2026						**July 1, 2026 - June 31, 2027**						**July 1, 2027 - June 31, 2028**					
	July-Aug	Sept-Oct	Nov-Dec	Jan-Feb	Mar-Apr	May-June	July-Aug	Sept-Oct	Nov-Dec	Jan-Feb	Mar-Apr	May-June	July-Aug	Sept-Oct	Nov-Dec	Jan-Feb	Mar-Apr	May-June
Project Planning																		
Project launch meeting (partners and advisors)																		
Project advisors consulted for expertise and feedback (2x per year)																		
Project team meetings (2x per month)																		
Cohort A planning																		
Revise program content and resources as needed																		
Toolkit Development																		
Initial design and prototyping (framework, activities, partnership resources)			X															
Refinement based on formative evaluation									X									
Final translation, photos, design, & publication															X			
Professional Learning Community (PLC)																		
Cohort A: test participants selected during proposal development																		
Cohort A: PLC convening & facilitation by project team																		
Cohort A: local implementation by museum-community partner pairs																		
Cohort A: feedback on PLC facilitation and toolkit due								X										
Cohort B: PLC convening & facilitation by project team																		
Cohort B: local implementation by museum-community partner pairs																		
Cohort B: feedback on PLC facilitation and toolkit due														X				
Evaluation																		
Front-end evaluation support for toolkit and PLC design																		
Formative evaluation: data collection, reports (Cohort A)																		
Summative evaluation: data collection (Cohort B)																		
Summative evaluation: analysis and final report																X		
Partner Communication, Recruitment, and Dissemination																		
Cohort B: participant application and award process																		
NISE Network communication (e.g. newsletter, blog posts, social media)																		
Share final version of toolkit on NISE Network Website																	X	
Online workshops and resources for the museum field								X										
ACM Conference presentations, workshops, and tabling						X						X						X
Publications for researchers and practitioners																		