

## Scaling, Supporting, and Sustaining Libraries as Community Hubs for Citizen Science (SSSL)

### STATEMENT OF NATIONAL NEED

Libraries inform and empower individuals and communities, functioning as anchors that provide resources and guidance necessary to an evolving workforce and lifelong learners (IMLS Convening on STEM Learning in Libraries, 2014). Libraries want low-cost, turnkey programming that aligns with their capacities to support or introduce patrons to hands-on STEM engagement and learning (The STEM Education Movement in Public Libraries, 2013). Citizen science is widely recognized for supporting and extending participants' learning in science (Jordan et al. 2011, Brossard et al. 2005), experiencing rapid growth (Bonney et al., 2014), and emerging as an innovative resource for libraries to support continuous learning for people of all ages (American Library Association, 2019). Citizen science enables people to engage with scientists to accelerate scientific research, leading to "contributions to research that would otherwise be impossible." This includes accelerating research in areas such as Alzheimer's and safe drinking water, investigating stars and galaxies in the far reaches of space, supporting successful long-lived projects such as bird counts, and tracking COVID symptoms.

Between 2017-2020, Arizona State University, in partnership with Arizona State Library, NISENet, and SciStarter (an online community with a database of over 3,000 citizen science projects and millions of visitors) piloted, field-tested, and evaluated "*Libraries as Community Hubs for Citizen Science*" (IMLS# LG-95-17-0158-17) to strengthen the position of libraries in AZ as community beacons of citizen science by providing physical and digital toolkits and resources that addressed:

- the libraries' desire for meaningful, turnkey, customizable, innovative, and locally situated STEM programming relative to their capacity and infrastructure;
- the citizen scientists' growing interest in learning about and joining local projects and their needs for short-term access to related low-cost instruments and resources;
- the scientists' need to recruit, train, equip, and sustain citizen scientists;
- SciStarter as an established online, prominent, public source to support libraries as they bring these communities together.

Based on encouraging evaluation results and in response to growing interest from libraries across the country, Arizona State University (ASU) and SciStarter propose a National Leadership project grant proposal, ***Scaling, Supporting, and Sustaining Libraries as Community Hubs for Citizen Science (SSSL)***. The \$600,000 project (and matching cost-share from the Moore Foundation and the Sloan Foundation [see supportingdoc1 "Letters of Commitment"]) will build on our current successful work in Arizona to enhance, mature, and nationally scale our project to increase libraries' support of lifelong learning, while reinforcing the role of libraries as valuable partners in addressing the needs of their communities. Embedding citizen science within the established infrastructure of libraries and drawing on the expertise of librarians, citizen science experts, and new community partners, allows SSSL to provide needed, well-established structure to the currently diffuse nature of citizen science efforts, while also collaborating with targeted partners to develop training and engagement resources to reach people historically excluded from participation in science.

During the pilot, six select libraries, representing underserved and underrepresented in STEM demographics across the Phoenix Metropolitan area (see supportingdoc3 "Pilot Libraries") collaborated with the project team, leading to the development of six physical citizen science kits (see supportingdoc4 "Kit Descriptions") that patrons check out in two-week increments and related promotional materials (see supportingdoc4 "Promotional Materials"); a microsite on SciStarter (SciStarter.org/Library-Kits) to provide patrons with step-by-step project instructions, "how to" videos, data entry forms, access to follow-on activities to sustain engagement, and data analytics on user adoption, engagement and persistence; and kit inventory lists and check-out procedure guidelines for libraries. Ongoing evaluative data from librarians and patrons was collected, and the project was awarded a year-long supplement in September 2019 to expand the project to additional libraries statewide. The

project team co-created the Library and Community Guide to Citizen Science, a comprehensive guide with an introduction to citizen science, the SciStarter platform, and valuable information and resources for bringing citizen science to more libraries. Enhanced digital features were created on SciStarter.org/Library-Kits and SciStarter.org/Library-Resources to help libraries access kits, projects, and resources. The project team is exploring ways to promote the kits through traditional print and digital ads and through local/targeted community connections, however deployment of these activities is delayed by the COVID crisis.

The pilot project demonstrated efficacy. Evaluation reported that librarians felt comfortable assisting patrons with the kits and facilitating kit circulation. **Library patrons reported increased awareness, interest, and knowledge of citizen science, as well as confidence in their ability to collect and interpret data. 92% of participants (the majority of which were women, typically underrepresented in STEM) expressed interest in checking out another citizen science kit.** Citizen science project scientists reported a notable increase in data from the Phoenix area. Additionally, SciStarter analytics suggest that users who interact with the library webpage where the kit projects are featured also view and contribute to numerous other citizen science projects.

Participating libraries leveraged their existing infrastructure, building upon their STEM programming capacity, growing relationships and collaborations with patrons and community members, increasing their own and their patrons' awareness of and confidence in citizen science through “responsive models and tools that engage communities and provide learning experiences for patrons across the lifespan.” (IMLS National Leadership Grants 2017). In sum, results suggest that communities are learning and benefiting from the “Libraries as Community Hubs for Citizen Science” pilot project and that additional tools for promoting awareness of the kits, bolstering facilitator comfort, and engaging diverse groups of patrons would further enable this program to better reach and support more people in the process of lifelong learning. (Librarians specifically requested assistance in connecting the kits and programs to the Girl Scouts, astronomy clubs, homeschoolers/educators, and 55+ populations.) Findings have been shared on DiscoverMagazine.com, SciStarter.org, dozens of invited professional and informal talks, workshops at the Citizen Science Association conference, and more. The PI was invited by ALA’s Information Technology Policy committee to speak about our work advancing citizen science through libraries at the American Library Association’s midwinter (2020) meeting.

The supplemental phase of evaluation focuses on summative impacts of the engagement, support, and resources utilized by partner libraries, however project team turnover and COVID-19 created challenges by halting proposed ad/promotions campaigns, community connection activities, and delaying library interviews. Despite these barriers, the project expanded in unexpected ways: Maricopa County Library District (AZ) and Los Angeles Public Libraries, two of the largest public library systems in the country, adopted and scaled the pilot kits and resources to dozens of libraries in their networks. Libraries throughout St. Louis, MO are offering the kits and resources to their popular astronomy clubs (<https://scistarter.org/darksky>). The Library and Community Guide to Citizen Science has been downloaded from SciStarter more than 1,000 times in the past four months. The Rural Activation Innovation Network (RAIN) in AZ and the National Network of Libraries of Medicine have joined the Arizona State Library (LSTA) in providing grants to libraries seeking support for the kits and programs. Encouraged by these outcomes, we recently administered an informal survey to gauge library interest in the kits and resources. The results were overwhelmingly positive, despite response challenges related to the COVID-19 pandemic and library closures and staff furloughs. Among the 140 library responses from across the country, we found high demand among libraries for these digital and physical kits and supporting resources and programs. 98% of libraries want our resources in their library, 95% would consider applying for grants from their State library, and 84% would even consider a \$1,500 in-kind commitment to support staff to help ensure success of our program in their library!

**Additional Current Significance:** Requests to SciStarter for accessible citizen science activities and resources have increased dramatically during the past year, likely due to increasing popularity of citizen science in general, greater public awareness of SciStarter (millions of visitors/year), and, more recently, COVID-19 social

distancing. In the past year, organizational representatives from 1) the Girl Scouts of USA, 2) NASA’s Night Sky Network (astronomy clubs), 3) the National Science Teaching Association (formal and informal STEM educators), and 4) Osher Lifelong Learning Institute at Arizona State University (55+ populations) have reached out for assistance in bringing citizen science to their organizations and in co-creating “train-the-trainer” programs to support members in facilitating citizen science engagement. Our proposed project (SSSL) will enable our team to create **mutually beneficial, strategic collaborations** with these organizations (“Community Partner Liaisons”\*) to connect their members to Libraries as Community Hubs for Citizen Science.

\*Community Partner Liaisons represent the following organizations seeking to co-create and implement customized training materials, including an “Introduction to Citizen Science” tutorial and guides on how to use SciStarter and how to effectively collaborate with libraries:

- 1) Girl Scouts USA- building on the Girl Scouts’ Think Like a Citizen Scientist Journey via SciStarter, training materials and citizen science library resources will help Troop Leaders and girls engage in citizen science and be more fully represented in the next generation of scientists.
- 2) NASA Night Sky Network- this coalition of hundreds of amateur astronomy clubs across the country will leverage training materials to connect the citizen science library kits and resources to their existing activities, engaging people in both rural and urban settings.
- 3) National Science Teaching Association- training materials will be used for Professional Development to help 50,000 members (including homeschool educators) effectively engage learners in citizen science and build awareness of citizen science library kits and resources. Our proposed project introduces an opportunity to experiment with school libraries as potential access points for the kits and resources.
- 4) OSHER Lifelong Learning Institute (at ASU)- we will build on our 2020 experimental “Train the Trainer” program co-created with the OSHER ASU chapter, to help more chapters across the country introduce the citizen science library kits and resources to their 55+ underserved STEM members.

Our proposed national project, *Scaling, Supporting, and Sustaining Libraries as Community Hubs for Citizen Science* (SSSL) will build on the successes and summative evaluation recommendations from the pilot, “Libraries as Community Hubs for Citizen Science” to: 1) enhance, scale, and promote a field-tested, replicable suite of citizen science kits and resources for libraries and training materials for libraries and community partners, to increase participation in citizen science through libraries as community anchors for lifelong learning; 2) identify libraries interested or engaged in citizen science to support an emerging, online national network of citizen science librarians that can generate and disseminate new ideas and best practices to libraries and community partners interested in adopting, informing, and sustaining Libraries as Community Hubs for Citizen Science; and 3) develop public-facing web tools on SciStarter.org to scale awareness of and access to ‘build, borrow, or buy’ kits and related resources in libraries. These goals are to mature, nationally scale, and sustain our successful pilot project to make a national impact on libraries in support of lifelong learning, while reinforcing the role of libraries as valuable partners in addressing the needs of their communities.

**BUILDING ON PAST PROJECTS:** This proposal builds on exploratory work (I-Corps L: Leveraging Citizen Science Pathways To Connect Millions Of People With Citizen Science Tools, NSF #1644554; and Exploring a Taxonomy for Citizen Science Tools, NSF #1644554) that defined the problem (lack of access to/understanding of instructions and tools) and opportunity (circulate kits through libraries). After understanding the needs of the project scientists and citizen scientists, we piloted and enhanced products and services in AZ (Libraries as Community Hubs for Citizen Science, IMLS #LG-95-17-0158-17) to understand our solution’s efficacy and demonstrate readiness for adoption. Based on validated results and national demand from libraries and community partners, we propose to **scale** the work and achieve greater impact on more libraries and targeted community partners. With a better **understanding of the needs of librarians and citizen scientists, we propose to improve and scale kits, resources, and services to meet the needs of a wider, integrated network of interested libraries.** Our project has evolved based on evaluation, analytics, and opportunities, and

the proposed project will enable us to support and understand **how others perceive, adapt, adopt, expand, re-interpret, and incorporate our work in different contexts and communities.**

This project will be informed by librarians familiar with STEM programming; advisors who have developed citizen science and STEM kits, programs, and professional development support for a network of libraries and museums and STEM facilitators; advisors with expertise in engaging underrepresented/underserved communities; and internationally recognized citizen science experts. (See “Project Resources,” below.) The project team holds substantial expertise in citizen science (ASU, SciStarter), developing and implementing kits for programming and training in libraries and community organizations (ASU, NISEnet, STARnet, SciStarter), creating and sustaining online communities of practice (NISEnet, STARnet), experience in state-wide and national library programming (AZ State Library, STARnet), and expertise in best practices for inclusive, diverse, and equitable approaches to training/learning/engagement (ASU's Office of Diversity, Equity and Inclusion, ASU instructional designers, and Community Partner Liaisons). Community Partner Liaisons, representing organizations reaching underserved (seniors; rural communities) and underrepresented (women) in STEM populations, will provide expert guidance on customized training materials and help coordinate efforts to recruit and pair members with local, participating libraries in at least 10 states. (See Letters of Commitment.)

These collective experiences will inform kit and program enhancements, implementation, and scaling. To further assist interested libraries, we have secured commitments from the National Network of Libraries of Medicine, State Library funders, and the Rural Activation and Innovation Network to provide mini grants to libraries seeking to become Community Hubs for Citizen Science.

## PROJECT DESIGN

We aim to offer libraries an effective, affordable, novel way to meet community needs for STEM programming. There is an unmet need for STEM support as the percentage of 21st century jobs that emphasize this knowledge and skills base increases, and as more people seek community support and access to citizen science projects and instruments. The project outputs will offer multiple entry points that acknowledge varying capacities of libraries and Community Partners:

- Enhanced public-facing web tools on SciStarter to enable libraries to register to ‘build, borrow, or buy’ existing kit resources (developed in the Pilot), access updated kit resources, and indicate interest in new project kit development. (Goal 3)
- New section on SciStarter.org/library-resources to help libraries discover grant opportunities to support their interest in the citizen science kits, materials, and programs. (Goal 2)
- New health/medicine kit to replace one current kit which is AZ-centric. (Goal 1)
- Enhanced kit materials and new tutorials to introduce librarians to citizen science, the kits, and how to access, circulate, and build patron engagement. (Goal 1)
- Customized training tutorials for each of four community partners, co-created by ASU’s instructional designers, Community Partner Liaisons and Advisors to introduce their constituents to citizen science, how to use SciStarter, and how to find/approach libraries as meeting spaces and valuable community resources. (Goal 1)
- Online “Citizen Science Library Network” registration and feature on SciStarter.org to support, network, and communicate with interested libraries and promote monthly newsletters and webinars to share updates and exchange ideas. (Goal 2)
- Regularly updated best practices for Library and Community Guide to Citizen Science. (Goal 2)
- New map-based feature on SciStarter.org to connect would-be and current citizen scientists with local libraries that have citizen science kits, events, and programs related to projects of interest to them. (Goal 3)
- New feature on SciStarter.org/Library-Resources (“People Finder”) to help librarians and community partners find and invite 1) local SciStarter citizen scientists to programs/events, and 2) citizen science project scientists to participate as subject matter experts in online or in-person events. (Goal 2, 3)

SSSL will enable libraries to build upon their existing, successful STEM programs, leveraging their capacity

and infrastructure to provide communities opportunities for participation in scientific research through citizen science. In addition to empowering libraries and their staff to serve as leaders and community hubs for STEM learning, this project continues to address known critical barriers in citizen science infrastructure, including lack of project awareness and access to the proper instruments, which prohibits sustained participation in citizen science. The project also enables collaborations with targeted partners to develop training and engagement resources reaching people historically excluded from participation in science.

SSSL is planned as a three-year project to achieve the following objectives:

Objectives	Key Activities	Measurable Outcomes
increase library staff awareness of citizen science, kits, and resources [see Letters of Support]	enhance librarian-oriented introduction to citizen science and instructions to access, circulate and promote kits	Library staff ability to explain citizen science to patrons, discover patron's interests, direct patrons to kits, resources, programs
increase Community Partners' awareness of citizen science, kits/resources/programs at libraries	customize community partners' tutorials/introduction to citizen science, SciStarter, and kits/resources	community partners' members ability to explain citizen science, access libraries, use kits/resources/projects
support a national network of citizen science libraries (AZ librarians and libraries in an additional 10 states)	create online "Citizen Science Library Network" on SciStarter, collaborate with STARnet and other library networks to regularly invite librarians	librarian ability to discover, join, and post to the Network (i.e., awareness of forum utility, accessibility, perceived effectiveness)
enable libraries in at least 10 additional states to establish a loan/check-out program for citizen science kits by providing lessons learned, kit resources/materials, and general circulation considerations	enhance and make discoverable, turnkey resources and training resources to circulate citizen science kits	<ul style="list-style-type: none"> <li>- number of kits distributed to libraries outside of AZ</li> <li>- number of additional states represented in scale-out</li> <li>- number of kits loans to patrons (where circ stats are available)</li> </ul>
increase citizen scientists' engagement in projects through libraries	create searchable map on SciStarter to improve ability to find libraries offering kits and citizen science programs	Frequency of participation by patrons who borrowed kits; SciStarter's online analytics can track frequency and duration of contributions
lay groundwork for sustaining programming for years to come	Solicit, support and document alternative kit/program funding sources	<ul style="list-style-type: none"> <li>increased # of grants offered to libraries for citizen science kits and programs</li> <li>number of states offering grants</li> <li>Increased dissemination in professional fora</li> </ul>
evaluate, document and share best practices	Regularly update Library and Community Guide to Citizen Science (SciStarter.org/Library-Resources)	increased downloads of the Library and Community Guide librarians and community partners' reflections and feedback

SSSL is a three-year project with three primary phases.

**Phase 1: Sept. 2020 - June 2021.** The team will continue to provide ongoing access and support for existing

citizen science kits and resources through the SciStarter website, allowing any library to immediately become a Community Hub for Citizen Science; co-PI Dan Stanton, with guidance from advisor Anne Holland (STARnet) will lead the coordination of a network of citizen science librarians to facilitate information sharing and pursue library organizations and foundations to coordinate RFPs in support of the citizen science kits and resources for libraries. Evaluators will lead SWOT analysis and journey mapping with libraries, advisors, and Community Partner Liaisons to improve our current resources and programming, while identifying opportunities and challenges that would present barriers for libraries to fully serve as community hubs for citizen science. Project manager, Robin Salthouse, with guidance from advisor Paul Martin (NISEnet), ASU's Office of Diversity, Equity and Inclusion, ASU instructional designers, and Community Partner Liaisons will coordinate the production of the revised kits and resources for libraries and customized tutorials and guides for Community Partners; PI Darlene Cavalier (with guidance from advisor Don Ficken of the Dark Sky Assoc), will direct development of an online network database with supporting digital features, informed by the SWOT analysis and journey mapping outcomes, on SciStarter for open access to the materials, best practices, projects and kits, as well as step-by-step instructions for patrons to engage in projects, share/analyze data, and leave feedback about the kits. Formative evaluation will focus on: 1) establishing strengths and barriers to communications and needs of the stakeholders to effectively engage in the project and newly formed librarian network; 2) understanding how communities may utilize the training materials, citizen science resources, and libraries; 3) identifying opportunities and needs around the new and enhanced citizen science resources from the perspective of all stakeholders; and 4) establishing practices to disseminate information and best practices via the Network.

**Phase 2: July 2021 - Aug 2022.** Robin Salthouse (with guidance from advisor Lisa Lewis, Association for Rural & Small Libraries [ARSL]) will select the library partners in 10 states, representing urban/rural and youth/senior demographics. The revised kits and resources will be tested during a 14-week rotating circulation period; half (5) of the libraries will receive 2 copies of each of 5 kits to circulate for a total of 6 weeks with 2-week check out periods. The other half will receive, and test the kits during the next 6 weeks leaving 2 weeks to account for the hand-off during kit shipment. Simultaneously, local community partner members recruited by Community Partner Liaisons, will be paired with a local participating library. This group will test the new *Introduction to Citizen Science* tutorials and guides, and develop collaboration strategies with libraries. We will evaluate scalability conditions, effectiveness of updated materials, changes in librarians' and community partners' understanding of citizen science, the program's impact on participants' engagement in science, and perceptions of the library as a community hub for citizen science. Based on evaluation recommendations, Salthouse will coordinate final revisions to kits and resources, and Cavalier will guide upgrades to SciStarter to make final kits, materials, and tutorials available via an enhanced Build (download or purchase materials to create your own kit), Borrow (find a participating library), Buy (purchase out-of-the-box from a vendor) feature. Stanton will continue to host monthly calls to support librarians' knowledge and resource exchange. Formative evaluation will measure efficacy of enhanced materials and participant engagement, interest, and learning.

**Phase 3: Sept 2022 - Aug 2023.** During the third and final phase of the project, we will expand the network of librarians offering citizen science kits and programs, promote expansion, match citizen scientists to their local citizen science library, and broadly disseminate results through STARnet, SciStarter, library networks, the Citizen Science Library Network, the Citizen Science Association, and community partners. The project team will convene stakeholders online to create a plan to sustain the program nationally, as guided by advisors (see Project Resources). We will document and share outcomes and recommendations among library, citizen science, informal science education networks, community partners, and funders, providing an overview of the evaluation's activities, critical findings with supporting evidence, and forward-looking recommendations. Summative evaluation will assess the program's impact on the expansion and adoption of citizen science programming and stakeholder engagement, learning, and satisfaction with product outcomes and collaborations. Where available, circulation statistics will be aggregated to assess public outreach and impact.

**PROJECT RESOURCES: Personnel:** The project team is well positioned to adapt and scale a sustainable model nationwide. The PI overseeing this project is Darlene Cavalier, MA, professor of practice at ASU and founder of SciStarter who is a citizen science subject matter expert with experience bringing research projects to the public through SciStarter and developing physical and digital kits (with free, brandable support and promotional resources) for STEM learning in libraries. Cavalier will concentrate on digital infrastructure, community partnerships, dissemination of findings, manage communications, and develop the interim and final reports for IMLS. Co-PI Dan Stanton, MA, associate librarian at ASU and past president of Arizona Library Association, will lead the design of activities and host monthly outreach to support and grow the Citizen Science Library Network. The project manager, Robin Salthouse, MA, former adult services librarian at SERL and lead librarian project partner, will coordinate the project schedule, team, logistics, solicitations to and input from advisors and community partners at scheduled intervals, in-person and virtual meetings in Phase 1, 2, and 3, weekly calls with key staff and advisors as needed. A project coordinator will assist with the new kit/program rollouts/rotations, support online events, and support the project manager. Deron Ash, Asst. Director of Programs, will participate in project team meetings, assist in network operations, and manage personnel and administrative functions. SSSL Advisors provide a range of expertise: Chris Guerra at Arizona State Library (scaling/funding), Lisa Lewis at Small and Rural Libraries (scaling/reaching underserved/underrepresented communities), Vivian White at NASA's Night Sky Network (community building/scaling), Suzanne Harper at Girl Scouts USA (scaling/reaching underserved/underrepresented youth and women), Flavio Mendez at NSTA (scaling via formal/informal STEM educators), Don Ficken at Dark Skies Association (online/offline community building), Abby Baker at ASU Osher Lifelong Learning 55+ (scaling/reaching underserved seniors), Paul Martin at NISE Net (large scale museum network support and STEM kits), David Sittenfeld at the Museum of Science (community building, kits, museum forums), and Anne Holland, Project Director, STARnet (large scale library networks).

Project evaluation will be led by Dr. Shelly Potts (Senior Director) and Kristi Eustice, MC (Assistant Director) of Arizona State University's Office of Evaluation and Educational Effectiveness (UOEEE), in cooperation with Darlene Cavalier and key project team members and stakeholders. The UOEEE is uniquely qualified given the team's extensive training, expertise, and experience in monitoring and evaluating higher education projects funded by such agencies as the Institute of Museum and Library Services. The UOEEE will provide performance monitoring and independent evaluation of the IMLS grant objectives, activities and outcomes, as well as offer consultation for the project's internal, formative assessment and evaluation activities. UOEEE's mixed-method evaluative approach will include both formative and summative components to determine the extent to which the project's annual and overall objectives and outcomes have been met during and at the conclusion of the three-year funding period, gauge the quality and impact of the project's activities, and identify any unintended outcomes. Services include evaluation planning, IRB management, instrument design, document review, data collection, and reporting. UOEEE will also provide ongoing evaluation consultation to the project team throughout the funding period. Specific evaluation and consultation activities will be determined in conjunction with the PI on an annual basis and may vary from year to year, based upon the needs of the project. The evaluation design will include librarians', Community Partner Liaisons', advisors' project teams' and participants' perspectives and documentation of the project's implementation and impact.

**COMMUNICATIONS PLAN:** We will leverage our individual networks to collaboratively share project resources, best practices, and opportunities through presentations at the Citizen Science Association conference at ASU, library conferences, and continued speaking engagements with NNLM, etc; online via ASU, SciStarter, DiscoverMagazine.com, and GotScience.org blogs, monthly webinars, the Citizen Science Assoc. Listserv, library associations' digital outreach, SciStarter's project owners (1600+) and citizen scientists (75,000+); SciStarter and partners' social media, partners' networks; and via Journals: We will seek publication in *Citizen Science: Theory and Practice* and library journals to build on and fill current gaps in relevant literature.

**DIVERSITY PLAN:** Our work will be informed by advisors at ASU’s Office of Diversity and the Citizen Science Association’s Working Group on Equity, Diversity, and Inclusion, and developed, in part, through a tight collaboration with Community Partners reaching underserved and underrepresented populations in STEM.

**NATIONAL IMPACT:** This project will scale a field-tested, replicable suite of citizen science kits and provide new resources, allowing libraries, regardless of their financial resources, to offer patrons an effective engagement with authentic science through participation in citizen science. The project team of librarians, informal STEM educators, practitioners, and community organizers, will: 1) enhance, scale, and promote citizen science kits and resources to increase participation in citizen science through libraries as community anchors for lifelong learning; 2) support an emerging, online national network of citizen science librarians to generate and disseminate new ideas and best practices to libraries and community partners interested in adopting the citizen science resources; and 3) develop public-facing web tools on SciStarter.org to increase awareness and access to ‘build, borrow, or buy’ kits and related resources for citizen science engagement through libraries. These goals intend to nationally scale, mature, and sustain Libraries as Community Hubs for Citizen Science supporting lifelong learning, while reinforcing the role of libraries as valuable partners in addressing the needs of their communities. This project strengthens the position of libraries as community anchors by empowering them to promote civic engagement, cultural opportunities, and economic vitality through encouraging their patrons to take an active role in finding solutions, alongside scientists, with science-based community issues. Citizen science enables people of all ages, cultures, and skill sets to engage in real scientific research by collecting or analyzing data that is shared with professional scientists, while also provenly increasing public understanding of science. The project meets the IMLS agency-level goal of placing the learner at the center, supporting their ability to contribute to the collection of data and issues that are relevant and meaningful to them.

**SUSTAINABILITY:** At the completion of the project, project resources and best practices will be published on SciStarter.org under a Creative Commons license. ASU and SciStarter will continue to support the library network and citizen scientists as we intend to join forces on future proposals that sustain and extend the program to science museums with NISEnet and STARnet, developing a robust community of practice between citizen science museums and libraries. Grants to citizen science libraries from the National Network of Libraries of Medicine, the Rural Activation and Innovation Network, and a growing number of State Libraries will help sustain the project for years to come.

Evaluation Plan

<p>Goal 1: scale and promote a field-tested, replicable suite of citizen science resources and training materials for libraries in collaboration with advisors, libraries and targeted Community Partner Liaisons, to increase participation in citizen science through libraries as community anchors for lifelong learning.</p>			
<i>Project Objective</i>	<i>Data Sources</i>	<i>Methods</i>	<i>Outcomes</i>
Support and increase four community partners’ awareness of citizen science and library kits/resources/programs	-Community partner liaisons (CPL)	-CPL survey/interview	-CPLs report feeling supported -CPLs report awareness and knowledge around citizen science -CPLs report comfort engaging with others about citizen science (and facilitating programming)



Identify individual strengths, needs, opportunities, and threats in project materials	-Librarians -CPL -Advisors	-Journey mapping/ SWOT analysis (by stakeholder group)	-Stakeholders identify material modifications to uniquely fit the needs of the organization/target audience with a focus on underrepresented communities in science -Stakeholders discuss and explore ways that materials can be used and identify barriers to implementation/use with a focus on underrepresented communities in science
Modify citizen science materials to meet the unique needs of differing libraries and community organizations through pilot testing of updated materials in 10 libraries and across all four CPLs	-Librarians -CPL -Patrons	-Librarian/CPL survey/interviews -Patron kit user survey	-Librarians/CPLs report quality of resources and modified materials as high, relevant, and user-friendly -Patron kit users report satisfaction with kits, increased intention to engage in citizen science, increased knowledge of science, confidence in data collection and ability to interpret data -Patron kit users endorse libraries as community hubs for citizen science -Patron demographics indicate pilot testing with a diverse pool of users
Develop and pilot a new health-related citizen science kit	-Librarians -CPLs -Instructional designers -Advisors	-User testing (survey)	-Creation of a health-related kit -Users report kit accessibility and quality as high -Users report satisfaction with kit instructions, tools, and materials
Enable libraries to establish a loan/check-out program for citizen science kits, resources/materials	-SciStarter -Resources created	-Analytics review -Document review	-# libraries and states adopting loan program per SciStarter registration and tracking -Creation and tracking of a mini training suite including enhanced kit materials and online tutorials
<b>Goal 2: support an emerging national network of citizen science librarians to generate and disseminate new ideas and best practices to consider adopting, informing, and sustaining Libraries as Community Hubs for Citizen Science.</b>			
<i>Project Objective</i>	<i>Data Sources</i>	<i>Methods</i>	<i>Outcomes</i>
Support and sustain a national network of citizen science libraries/librarians to increase staff awareness and comfort with citizen science engagement	-Librarians -SciStarter -Newsletters -Webinars -Online discussion forum	-Analytics review -Document review -Librarian survey/interview	-# libraries in network (AZ and not) -Participation rates in monthly meetings/webinars -Librarians report feeling supported ,increased awareness and knowledge around citizen science -Librarians report comfort engaging with patrons about citizen science (and directing them to programming) -Librarians report awareness and utility of the SciStarter Citizen Science Library Network

Lay groundwork for sustaining programming for years to come through increasing awareness and access to kit/program funding for libraries	-SciStarter microsite	-Document review	-Mini-grant section created on microsite -# grant opportunities identified -# states offering grant opportunities -Dissemination of professional fora (presentations, publications, etc.)
Evaluate, document, and share best practices	-Librarians -CPLs -Advisors -SciStarter	-Interviews/focus groups -Analytics review	-Stakeholders identify lessons learned and best practices discovered -Lessons learned and best practices are available on SciStarter -# downloads of the Library and Community Guide to Citizen Science (and increases over time)
Goal 3: develop public-facing web tools on SciStarter.org to scale access to 'build, borrow, or buy' kit resources and promote the availability of citizen science projects and resources in libraries.			
<i>Project Objective</i>	<i>Data Sources</i>	<i>Methods</i>	<i>Outcomes</i>
Publicly promote the adoption of citizen science kits at libraries to increase citizen scientists' awareness of and engagement in citizen science projects through libraries and community organizations	-SciStarter -Circulation statistics	-Document review -Analytics review	-# features/kits added (Event finder, map of libraries with kits) -# updated training resources -# kits distributed in/outside of AZ -# of kit loans to patrons (where circulation statistics are available) -Analytics show SciStarter users complete 1 kit-related project and contribute to others

## **Schedule of Completion**

### **September 2020 – October 2020**

Virtual kick off meeting with 10 representative librarians (see Letters of Support), 5 Kit-Project Scientists, project PIs, Advisors, ASU Instructional Designer, project managers, Community Partner Liaisons, and evaluators to discuss project goals, objectives, activities/roles, timeline, and communications tools. Schedule Journey Mapping with Community Partner Liaisons, Representative Librarians, and Project Scientists.

Continue to promote and offer to interested libraries the existing kits and resources via [SciStarter.org/library-resources](https://SciStarter.org/library-resources); continue support to current libraries and citizen scientists. Create "Citizen Science Library Network" on SciStarter based on input received from the kick off meeting. Includes registration, libraries/projects database, and listserv.

### **November 2020 -- December 2020**

Promote "Citizen Science Library Network" through project Advisors, STARnet, NNLM, building on 150 libraries who have already expressed a desire to circulate the kits -- co-PI Dan Stanton will stoke and moderate this forum.

Create library kits/resources registration on SciStarter to better track usage of existing kits and materials and to help citizen scientists and community partners locate library resources.

Scheduled Journey mapping begins.

### **January 2021**

Identify funding organizations and promote/communicate opportunities/partnerships to provide financial resources for libraries (ongoing)

Initiate online monthly support meetings and online monthly professional development programming (webinars and other activities featuring Advisors, Community Partners, project managers, librarians, SciStarter staff) recorded live and archived.

Meeting (virtual): Community Partners, project scientists, and library partners to draft "Engaging with libraries" chapter to add to the Library and Community Guide to Citizen Science.

### **February 2021**

Kit project team virtually meets with ASU Office of Diversity, Equity and Inclusion (ODEI), Instructional Designers, and Advisors to ensure revised materials will be inclusive.

Identify and promote opportunities for dissemination about network at large and specific projects and partnerships; newsletters, journal articles, library and other professional conferences, and speaking engagements. (ongoing)

### **March 2021 -- April 2021**

Workshop existing kits/resources at the CitSciAssoc conference, hosted by ASU; share feedback with instructional designer and project team.

Begin development of new digital features such as Location Mapper and People-finder.

**April 2021 -- May 2021**

Evaluators distill feedback from journey mapping and kit team and instructional designer meet to begin work on revising materials and tutorials and creating the new health/medicine kit.

**May 2021 -- June 2021**

Prototype revised kits, materials and tutorials

**August 2021**

Test the revised kits, supporting materials, tutorials and related web-wireframes with advisors and Community Partner Liaisons (who have agreed to pilot test them via focus groups with their community members)

Create the new health/medicine kit.

**September 2021 -- November 2021**

Modify materials based on feedback. Produce revised kits and resources. Post updated materials on [SciStarter.org/Library-resources](https://SciStarter.org/Library-resources) and [Library-Kits](https://SciStarter.org/Library-Kits).

**December 2021 -- March 2022**

Pair 10 libraries in 10 states with local community partner members identified by Community Partner Liaisons to use the kits and resources in 16-week testing period (2 copies of each of 5 kits rotated between 10 Partner Libraries with 2-week check outs ): We will seek to understand scalability conditions, understand how communities use the resources and libraries, evaluate changes in librarian's and community partners' understanding of citsci and the kits; Evaluate program's impact on participants' engagement in citizen science and perceptions of the library as a community hub for citizen science.

**April 2022 -- June 2022**

Modify final version of the kits and materials based on feedback.

September (ongoing): Activate advisors, community partners, project scientists, library network, funders, ASU, Citizen Science Association ++ to build awareness of and access to the kits and resources.

**August 2022 -- April 2023 (and ongoing)**

Continue to support and foster connections between Community partners, CitSci Library Network and citizen scientists via customer service, open calls, monthly online events, forums and programming.

**May 2023 -- August 2023**

Evaluation: stakeholder meet-ups, data collection, analysis, and final reports and dissemination of lessons learned and best practices.





## DIGITAL PRODUCT FORM

### INTRODUCTION

The Institute of Museum and Library Services (IMLS) is committed to expanding public access to digital products that are created using federal funds. This includes (1) digitized and born-digital content, resources, or assets; (2) software; and (3) research data (see below for more specific examples). Excluded are preliminary analyses, drafts of papers, plans for future research, peer-review assessments, and communications with colleagues.

The digital products you create with IMLS funding require effective stewardship to protect and enhance their value, and they should be freely and readily available for use and reuse by libraries, archives, museums, and the public. Because technology is dynamic and because we do not want to inhibit innovation, we do not want to prescribe set standards and practices that could become quickly outdated. Instead, we ask that you answer questions that address specific aspects of creating and managing digital products. Like all components of your IMLS application, your answers will be used by IMLS staff and by expert peer reviewers to evaluate your application, and they will be important in determining whether your project will be funded.

### INSTRUCTIONS

If you propose to create digital products in the course of your IMLS-funded project, you must first provide answers to the questions in **SECTION I: INTELLECTUAL PROPERTY RIGHTS AND PERMISSIONS**. Then consider which of the following types of digital products you will create in your project, and complete each section of the form that is applicable.

#### **SECTION II: DIGITAL CONTENT, RESOURCES, OR ASSETS**

Complete this section if your project will create digital content, resources, or assets. These include both digitized and born-digital products created by individuals, project teams, or through community gatherings during your project. Examples include, but are not limited to, still images, audio files, moving images, microfilm, object inventories, object catalogs, artworks, books, posters, curricula, field books, maps, notebooks, scientific labels, metadata schema, charts, tables, drawings, workflows, and teacher toolkits. Your project may involve making these materials available through public or access-controlled websites, kiosks, or live or recorded programs.

#### **SECTION III: SOFTWARE**

Complete this section if your project will create software, including any source code, algorithms, applications, and digital tools plus the accompanying documentation created by you during your project.

#### **SECTION IV: RESEARCH DATA**

Complete this section if your project will create research data, including recorded factual information and supporting documentation, commonly accepted as relevant to validating research findings and to supporting scholarly publications.

## **SECTION I: INTELLECTUAL PROPERTY RIGHTS AND PERMISSIONS**

**A.1** We expect applicants seeking federal funds for developing or creating digital products to release these files under open-source licenses to maximize access and promote reuse. What will be the intellectual property status of the digital products (i.e., digital content, resources, or assets; software; research data) you intend to create? What ownership rights will your organization assert over the files you intend to create, and what conditions will you impose on their access and use? Who will hold the copyright(s)? Explain and justify your licensing selections. Identify and explain the license under which you will release the files (e.g., a non-restrictive license such as BSD, GNU, MIT, Creative Commons licenses; RightsStatements.org statements). Explain and justify any prohibitive terms or conditions of use or access, and detail how you will notify potential users about relevant terms and conditions.

**A.2** What ownership rights will your organization assert over the new digital products and what conditions will you impose on access and use? Explain and justify any terms of access and conditions of use and detail how you will notify potential users about relevant terms or conditions.

**A.3** If you will create any products that may involve privacy concerns, require obtaining permissions or rights, or raise any cultural sensitivities, describe the issues and how you plan to address them.

## **SECTION II: DIGITAL CONTENT, RESOURCES, OR ASSETS**

**A.1** Describe the digital content, resources, or assets you will create or collect, the quantities of each type, and the format(s) you will use.

**A.2** List the equipment, software, and supplies that you will use to create the digital content, resources, or assets, or the name of the service provider that will perform the work.

**A.3** List all the digital file formats (e.g., XML, TIFF, MPEG, OBJ, DOC, PDF) you plan to use. If digitizing content, describe the quality standards (e.g., resolution, sampling rate, pixel dimensions) you will use for the files you will create.

### **Workflow and Asset Maintenance/Preservation**

**B.1** Describe your quality control plan. How will you monitor and evaluate your workflow and products?



**B.2** Describe your plan for preserving and maintaining digital assets during and after the award period. Your plan should address storage systems, shared repositories, technical documentation, migration planning, and commitment of organizational funding for these purposes. Please note: You may charge the federal award before closeout for the costs of publication or sharing of research results if the costs are not incurred during the period of performance of the federal award (see 2 C.F.R. § 200.461).

## **Metadata**

**C.1** Describe how you will produce any and all technical, descriptive, administrative, or preservation metadata or linked data. Specify which standards or data models you will use for the metadata structure (e.g., RDF, BIBFRAME, Dublin Core, Encoded Archival Description, PBCore, PREMIS) and metadata content (e.g., thesauri).

**C.2** Explain your strategy for preserving and maintaining metadata created or collected during and after the award period of performance.

**C.3** Explain what metadata sharing and/or other strategies you will use to facilitate widespread discovery and use of the digital content, resources, or assets created during your project (e.g., an API [Application Programming Interface], contributions to a digital platform, or other ways you might enable batch queries and retrieval of metadata).

### **Access and Use**

**D.1** Describe how you will make the digital content, resources, or assets available to the public. Include details such as the delivery strategy (e.g., openly available online, available to specified audiences) and underlying hardware/software platforms and infrastructure (e.g., specific digital repository software or leased services, accessibility via standard web browsers, requirements for special software tools in order to use the content, delivery enabled by IIIF specifications).

**D.2.** Provide the name(s) and URL(s) (Universal Resource Locator), DOI (Digital Object Identifier), or other persistent identifier for any examples of previous digital content, resources, or assets your organization has created.

## **SECTION III: SOFTWARE**

### **General Information**

**A.1** Describe the software you intend to create, including a summary of the major functions it will perform and the intended primary audience(s) it will serve.

**A.2** List other existing software that wholly or partially performs the same or similar functions, and explain how the software you intend to create is different, and justify why those differences are significant and necessary.

### **Technical Information**

**B.1** List the programming languages, platforms, frameworks, software, or other applications you will use to create your software and explain why you chose them.

**B.2** Describe how the software you intend to create will extend or interoperate with relevant existing software.

**B.3** Describe any underlying additional software or system dependencies necessary to run the software you intend to create.

**B.4** Describe the processes you will use for development, documentation, and for maintaining and updating documentation for users of the software.

**B.5** Provide the name(s), URL(s), and/or code repository locations for examples of any previous software your organization has created.

## Access and Use

**C.1** Describe how you will make the software and source code available to the public and/or its intended users.

**C.2** Identify where you will deposit the source code for the software you intend to develop:

Name of publicly accessible source code repository:

URL:

## SECTION IV: RESEARCH DATA

As part of the federal government's commitment to increase access to federally funded research data, Section IV represents the Data Management Plan (DMP) for research proposals and should reflect data management, dissemination, and preservation best practices in the applicant's area of research appropriate to the data that the project will generate.

**A.1** Identify the type(s) of data you plan to collect or generate, and the purpose or intended use(s) to which you expect them to be put. Describe the method(s) you will use, the proposed scope and scale, and the approximate dates or intervals at which you will collect or generate data.

**A.2** Does the proposed data collection or research activity require approval by any internal review panel or institutional review board (IRB)? If so, has the proposed research activity been approved? If not, what is your plan for securing approval?

**A.3** Will you collect any sensitive information? This may include personally identifiable information (PII), confidential information (e.g., trade secrets), or proprietary information. If so, detail the specific steps you will take to protect the information while you prepare it for public release (e.g., anonymizing individual identifiers, data aggregation). If the data will not be released publicly, explain why the data cannot be shared due to the protection of privacy, confidentiality, security, intellectual property, and other rights or requirements.

**A.4** What technical (hardware and/or software) requirements or dependencies would be necessary for understanding retrieving, displaying, processing, or otherwise reusing the data?

**A.5** What documentation (e.g., consent agreements, data documentation, codebooks, metadata, and analytical and procedural information) will you capture or create along with the data? Where will the documentation be stored and in what format(s)? How will you permanently associate and manage the documentation with the data it describes to enable future reuse?

**A.6** What is your plan for managing, disseminating, and preserving data after the completion of the award-funded project?

**A.7** Identify where you will deposit the data:

Name of repository:

URL:

**A.8** When and how frequently will you review this data management plan? How will the implementation be monitored?