Building Library Professionals' Creative Learning Competency for Facilitation of STEM Programming

The MIT Media Lab (J. Philipp Schmidt) seeks IMLS funding of $246,782 for a two-year Lifelong Learning Piloting Project Grant, to better prepare public library professionals as confident facilitators of creative STEM learning programs. More and more, libraries are charged with offering relevant STEM programming to their communities, yet few library professionals feel prepared to lead such activities or design learning programs that emphasize equity and inclusion. Leveraging the pedagogy of creative learning, this project aims to deliver a series of in-person and online workshops, foster an ongoing online community of practice, and build capacity for 300 library professionals to implement creative STEM programming in their communities.

I. Statement of Broad Need

There is a need to cultivate a broader understanding of science, technology, engineering, and mathematics (STEM), because these disciplines help learners develop crucial competencies as critical thinkers and problem solvers. The Committee on STEM Education of the National Science and Technology Council underscored the importance of STEM learning when it put forth a vision where, "all Americans will have lifelong access to high-quality STEM education." This vision, the Committee wrote, would be achieved only by urgent, collective action by the STEM community on three goals: building strong foundations for STEM literacy; increasing diversity, equity, and inclusion in STEM; and preparing the STEM workforce for the future.[1]

Recent reports highlight numerous ways that public libraries address each of these goals.[2,3] In particular, public libraries have emerged as critical hubs for providing immersive STEM learning experiences, they serve diverse communities and hold great promise for promoting STEM equity and access, and they fill workforce-related gaps left by the under-resourced formal education sector. Unsurprisingly, public libraries and their staff are increasingly tasked with offering STEM programming and learning resources to their patrons, and while library professionals generally want to meet this need, many feel unprepared.

In a national survey of public library professionals, 97% of respondents (n=438) said that they are interested in offering more STEM learning opportunities to their patrons, but a number of common barriers, including feeling ill-prepared to lead an activity and a lack of expertise in STEM topics, prevent them from beginning or increasing STEM programming.[4] Considering the growing number of roles that library professionals are asked to take on, it is infeasible to expect all library professionals to transform into STEM *experts* or *instructors*. However, more library professionals of all backgrounds could become skilled and confident STEM learning *facilitators* if they had access to appropriate training opportunities.[5]

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[1] Committee on STEM Education of the National Science and Technology Council. "Charting a Course for Success: America's Strategy for STEM Education." 2018: 5.
[2] Shtivelband, A., Wallander Roberts, A., and R. Jakubowski. "STEM Equity in Informal Learning Settings: The Role of Public Libraries." *Report to Space Science Institute's National Center for Interactive Learning.* 2016: 7-9.
[3] Baek, J. "Public Libraries as Places for STEM Learning: An Exploratory Interview Study with Eight Librarians." *A National Center for Interactive Learning Report, Space Science Institute.* 2013: 5 - 7.
[4] Hakala, J.S., MacCarthy, K., Dewaele, C., Wells, M., Dusenbery, P. B., and K. LaConte. "STEM in Public Libraries: National Survey Results." *Space Science Institute's National Center for Interactive Learning,* 2016: 11.
[5] Lankes, D.R. "Expect More: Why Libraries Cannot Become STEM Educators." *Public Libraries & STEM: A National Conference on Current Trends and Future Direction*s. 2015: 1-5.

Creative learning (CL) is a pedagogical approach that enables library professionals to take on the responsibilities and practices of STEM facilitation, without requiring them to become technical domain experts. CL is rooted in constructionism and facilitation, was developed at the MIT Media Lab, and provides the theoretical framework for curriculum design in this project. CL posits that people learn best when they are working on projects that they are passionate about, in collaboration with peers, and in a playful environment that encourages experimentation.[6] These learning environments are supported by facilitators who guide learner interests rather than prescribes or directs their activities. Because of this, facilitators of creative STEM learning experiences need not be subject-matter experts. Instead, by cultivating their own facilitation practice, library professionals can become competent and confident to welcome, support, and guide diverse learners.

The CL pedagogy not only lowers the barrier to entry for library professionals who seek to develop STEM programs, but also ensures that these programs prioritize equity and inclusion of diverse communities of patrons. The emphasis on project-based, hands-on learning engenders modes of active learning known to be most effective in developing learner comfort with STEM topics.[7] Furthermore, CL facilitation enacted by librarian professionals can support informal learning activities that build on the interests of young learners with rich and varied backgrounds and can help to engage non-dominant youth in STEM programming.[8,9]

This project falls in the Lifelong Learning category. It aims to build capacity for 300+ library professionals to begin or increase creative STEM learning programs in their libraries—fostering attitudes of discovery, and cultivating skills such as critical thinking and creativity. The project reinforces the role of library staff as facilitators of lifelong learning and the role of libraries as providers of non-formal learning for communities with diverse backgrounds and needs. Furthermore, the project is designed to help library professionals engage learners of all ages—including families, teens, and adults—in creative learning programming on STEM topics.

II. Project Design

The project team proposes to design, deliver, and evaluate a series of in-person and online capacity building workshops for library professionals to become competent and confident facilitators of creative STEM learning programs. In addition, the project will support a cohort of Creative Learning Ambassadors and foster an online community of practice (CoP) to support regular opportunities for collective and critical reflection among participants—a key component for growing and sustaining a facilitation practice.[10] Library professionals who participate in the workshops and CoP will be able to:

1. Apply CL facilitation best practices to their STEM program offerings.
2. Feel confident and supported in their efforts to increase STEM learning opportunities for their patrons.
3. Adapt existing STEM learning content to align with creative learning principles.

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[6] Resnick, M. "Lifelong Kindergarten: Cultivating Creativity through Projects, Passion, Peers, and Play." *MIT press*. 2017: 16.
[7] National Research Council. "Successful K-12 STEM Education: Identifying Effective Approaches in Science, Technology, Engineering, and Mathematics." *The National Academies Press*. 2011.
[8] Barron, B., Gomez, K., Pinkard, N., Martin, C.K., Austin, K., Gray, T., Levinson, A., Matthew, J., Mertl, V., Richards, K.A., Rogers, M., Stringer, D., and J. Zywica. "The Digital Youth Network: Cultivating Digital Media Citizenship in Urban Communities." *MIT Press*. 2014
[9] Vossoughi, S., Escudé, M., Kong, F., and P. Hooper. "Tinkering, Learning & Equity in the Afterschool Setting." *FabLearn Conference Proceedings at Stanford University.* 2013.
[10] Roque, R. and R. Jain. "Becoming Facilitators of Creative Computing in Out-of-School Settings." *Rethinking Learning in the Digital Age: Making the Learning Sciences Count, 13th International Conference of the Learning Sciences.* 2018: 598.

The project is organized in a series of activities that build on each other (see more detail further below):

- **Workshop curriculum development:** In collaboration with partner library systems, the project will create curricula for hands-on and online workshops for facilitation of creative STEM learning.
- **Outreach and recruitment:** 300+ library professionals will be invited to participate in two in-person workshops (75 participants each) and an online course (150+ library professionals).
- **Creative Learning Ambassadors:** 25 Creative Learning Ambassadors will serve as advocates for creative learning in their local communities.
- **In-person workshops ("Facilitating Creative Learning"):** Two hands-on workshops; hosted at Cambridge Public Library in Cambridge, MA and Middle Georgia Regional Library in Macon, GA.
- **Open-access online course ("Facilitating Creative Learning"):** A modified version of the in-person workshop will be offered as an open online course for 150+ library professionals.
- **Online community of practice (CoP):** An online community to support library professionals as they build out their facilitation practice and develop creative STEM learning programs in their libraries.
- **Broad dissemination of project outcomes:** All project resources, incl. workshop curricula and the self-paced version of the online course, will be published as open access resources and shared broadly.
- **Ongoing evaluation:** The project team will continuously monitor activities and outcomes in order to iteratively improve project materials and deliverables, and evaluate project impact.

Background

The proposed project builds on a strong foundation of prior work at MIT. The Public Library Innovation Exchange (PLIX) is a collaboration between MIT Media Lab researchers and public libraries to co-design creative STEM learning programs. PLIX launched in 2017 with support from the Knight Foundation and has closely collaborated with ten public library systems (Akron, Boston, Cambridge, Charlotte, Columbia, Macon, Milledgeville, Philadelphia, Somerville, and St. Paul), and connected with over 250 library professionals.[11]

PLIX creates creative STEM learning programs connected to MIT research. The program includes a residency exchange that teams up librarians and MIT researchers who work together to co-design learning activities. These activities are then disseminated in the form of physical kits of materials and tutorials that make it easy for librarians to get started. PLIX activities and kits bring a creative learning approach to a wide array of STEM topics, for example: coding and creating with *Scratch and micro:bit* controllers to bridge the digital and the physical world; a friendly introduction to electronics with *Chibitronics circuit stickers*; and the *Databasic.io* set of tools and activities that allow learners to use data in creative and engaging ways.

In October 2019, the PLIX project team ran an exploratory in-person workshop to support the dissemination of PLIX activities in collaboration with the Akron-Summit County Public Library in Akron, Ohio.[12] Over two days, 38 library professionals from the region were introduced to the facilitation of PLIX activities and the creative learning pedagogy. The feedback was overwhelmingly positive. Workshop participants reported that the event helped them to get back in touch with their spirit of creativity, and that they were excited to start planning new STEM programming for their patrons as a result. In a survey, participants were asked how likely

[11] For more information, please visit the PLIX website: https://plix.media.mit.edu
[12] For additional detail, please visit the PLIX Akron workshop reflection blog post: https://www.media.mit.edu/posts/plix-in-akron/

they would be to recommend a future PLIX workshop to a colleague or fellow library professional and the average response was 9.7/10. Specific feedback highlighted the ways in which the workshop helped participants feel more comfortable utilizing new technologies and creative learning methodologies in a fun and engaging environment:

- "Hands-on practical knowledge that I can take back to my library and implement with ease. I think the philosophies of facilitation and creative learning are inspiring and important. I feel supported by my fellow librarians that I met this week and feel refreshed to return to my busy library!" - *Youth Services Librarian*
- "It was extremely educational. The set up made learning so easy and I feel competent that I can go back and put together several programs for any age group." - *Teen Librarian*
- "It was an amazing and enlightening experience. I started out being intimidated but ended up with a lot more confidence regarding using technology in my programs. This training has been the highlight of my career as a librarian." - *Branch Manager/Adult Services Librarian*

Building on the response to the Akron workshop, the proposed project will develop and test a one-day workshop format for facilitation of creative STEM learning programs that can be hosted at public libraries across the country. The project team will run two workshops to refine the curriculum and publish a guidebook to allow others to host additional workshops. Furthermore, the project team will adapt the in-person workshop into an open access, four-week online course and CoP to reach a larger number of library professionals.

Project Team and Resources

The project team is well-positioned to implement the project. The team has many years of experience working with public libraries and deep expertise in education and technology, including the development of digital tools used by tens of thousands of learners.[13] In addition, team members have successfully implemented dozens of in-person workshops, as well as an online course on creative learning with over 6,300 K-12 educators.[14] The project director is a co-founder and current board chair (uncompensated) of Peer 2 Peer University, a non-profit organization that works with public libraries and has received IMLS support. In addition to the core (funded) team, the project will leverage other resources within the Media Lab, including technology support services and communications department. Furthermore, other members of the Media Lab Learning Initiative work with public libraries and will collaborate closely with the project team.

Recruitment Plan

This project will directly reach 150 library professionals through two in-person workshops and 150+ through an online course. The in-person workshops will take place at Cambridge Public Library in Cambridge, MA, and at Middle Georgia Regional Library in Macon, GA (see letters of support from each library system in Supportingdoc1.pdf). These libraries were selected due to their ongoing participation in the PLIX project network and their interest and capacity to take on a leadership role in this proposed project. The two library systems represent a diverse array of urban, suburban, and rural libraries in different regional contexts. As with the Akron workshop, the project team will closely collaborate with each partner library to plan the workshops.

[13] For more information please visit the Unhangout website: https://unhangout.media.mit.edu
[14] For more information please visit the Learning Creative Learning website: https://learn.media.mit.edu/lcl

At each in-person workshop, we anticipate approximately 50 regional participants and an additional 25 participants from elsewhere across the United States. Workshop participant recruitment will prioritize under-represented populations in both STEM and the library and information science fields (see Diversity Plan for more details on selection criteria). An additional 150+ library professionals will be accepted into the online course using similar criteria (an open-access self-paced version of the course will allow open enrollment).

In addition, approximately 25 participants from the in-person workshops will be recruited to serve as Creative Learning Ambassadors and receive special support to take on a leadership role in their local community as well as in the project's online course. Ambassadors will be selected to represent a diverse cohort along the following criteria: geography, library size and context (e.g., rural, suburban, urban, tribal); service area (e.g., children, teens, adults, etc.); and comfort level with STEM topics.

Advisory Board

The project team has convened an advisory board who will help recruit, guide, and evaluate the program (see letters of support in Supportingdoc2.pdf). This advisory board includes:

- *Pamela Hickson-Stevenson, Director of Akron-Summit County Public Library:* Ms. Hickson-Stevenson has been a longtime partner of PLIX and collaborated with the project team to host the first PLIX Workshop in October 2019. She will assist with participant recruitment and serve as a mentor to Cambridge Public Library and Middle Georgia Regional Library.
- *Nichole Pinkard, Associate Professor, Learning Sciences at Northwestern University:* Dr. Pinkard is the co-founder of the YOUmedia Learning Labs Network, an organization that works closely with public libraries and is focused on interest-driven learning with a commitment to equity and digital inclusion. She will serve as a mentor for the workshop curriculum development, implementation, and evaluation. (*Please note: The project team has received email confirmation from Dr. Pinkard agreeing to join the advisory board, however due to the demands arising from the COVID-19 global health crisis, we have not yet been able to include a formal letter of support at the time of submitting this proposal.)*
- *Felton Thomas, Jr., Executive Director, CEO, Cleveland Public Library*: Mr. Thomas will draw on his experience as the former President of the Public Library Association (PLA) to assist with participant recruitment, helping to ensure that this project prioritizes participation from under-represented populations in the library and information science field.
- *TBD Advisory Board Member #4: The project team intends to recruit a fourth advisory board member who has experience working with rural libraries and communities to offer STEM educational programs. However, at the time of submitting this proposal, due to the COVID-19 global health crisis, we have been unable to secure a formal letter of support for this fourth member.*

Project Activities

This project comprises eight major activities to build capacity of public library professionals as facilitators of creative STEM learning programs and to broadly disseminate the results of the project.

(1) Workshop curriculum development. The first major activity, scheduled for August–October 2020, is to develop the workshop curriculum in collaboration with the project's partner library systems. The curriculum

will cover a one-day hands-on training workshop that includes best practices of creative learning facilitation and strategies for adapting existing STEM learning content to align with creative learning values. The starting point for curriculum development will be materials from the 2019 Akron workshop, which featured four primary activities: a) a creative learning facilitation training workshop; b) hands-on sessions and a role play activity to help participants develop a facilitation mindset; c) a session designed to help librarians apply the principles of creative learning to existing STEM learning content; and d) opportunities for sharing and reflection, designed to create a cohort of participants. The curriculum will be implemented at two in-person workshops (November 2020 and April 2021). Following the second workshop, and based on evaluation results, the project team will spend September–November 2021 adapting the in-person curriculum into a four-week "Facilitating Creative Learning" online course.

(2) Outreach and recruitment of library professionals. The project team will recruit 300+ library professionals to participate in the two in-person training workshops (75 participants at each workshop) and online course (150+ participants). The project team anticipates that approximately two-thirds of in-person participants will travel locally or regionally, while one-third will come from elsewhere in the country. The proposed project budget includes travel expenses for up to 50 workshop participants (25 for each workshop). There will be a much broader call for participation in the online course, as capacity is capped neither by travel costs nor venue size, and the project team will recruit 150+ participants.

(3) Creative Learning Ambassadors. We will recruit 25 Creative Learning Ambassadors from the in-person workshop participants. The ambassadors will serve as advocates for creative learning in their local community and take on leadership roles in the online course and community. Ambassadors will each receive a $1,000 honorarium for their time and participation, as well as additional support and training from the project team.

(4) Two in-person workshops ("Facilitating Creative Learning"). The project team will convene two hands-on "Facilitating Creative Learning" workshops, the first at Cambridge Public Library in Cambridge, Massachusetts in November 2020 and the second at Middle Georgia Regional Library in Macon, Georgia in April 2021. These will each be one-day workshops.

(5) Open-access online course ("Facilitating Creative Learning"). Adapting the in-person workshop materials into an online format, the project team will offer an online course over a four-week period in March 2022, with small group cohorts and interactive discussion activities, utilizing open-source, open-access software tools like Discourse (https://www.discourse.org/) and Unhangout (https://unhangout.media.mit.edu), the latter of which was developed by members of the project team.

(6) Cultivation of an online Community of Practice (CoP). The online CoP will launch in September 2021, and will provide ongoing support to practitioners as they build out their facilitation skills and offer creative STEM learning programming in their libraries. The CoP will serve as a hub to: a) host monthly online meetups for group reflection on facilitation practice; b) promote and maintain a platform for discussion and resource sharing (including in-person workshop materials) among library professionals; and c) support Ambassadors to take on leadership roles within their local communities and within the CoP.

(7) Dissemination of project outcomes. The results of the project, including methods used, will be disseminated to the library and information science community through a number of activities (described fully in the Dissemination Plan section below). The in-person workshop curriculum will be documented and shared broadly between May–July 2021. From April–June 2022, the support materials for the Ambassadors will be finalized and the four-week online course will be compiled into an openly accessible, self-paced version that will be hosted and maintained as part of the ongoing PLIX project. These resources will be disseminated broadly from June–July 2022. All materials will be published under an open-access license.

(8) Ongoing evaluation. Finally, following each workshop, the project team will conduct a variety of evaluation activities (described fully in the Evaluation Plan section below) in order to inform iterative refinement of the workshop curriculum, as well identify any points of friction in the participant learning experience. The evaluation results will be shared with partner library teams and the Advisory Board members. This will give the project team access to multiple channels of support to address any emerging concerns with progress and allow for project modification, as needed, to ensure successful outcomes. These results will also be published on the project website, alongside all workshop materials.

The Schedule of Completion (Figure 1 below), illustrates the order and timeline of project activities.

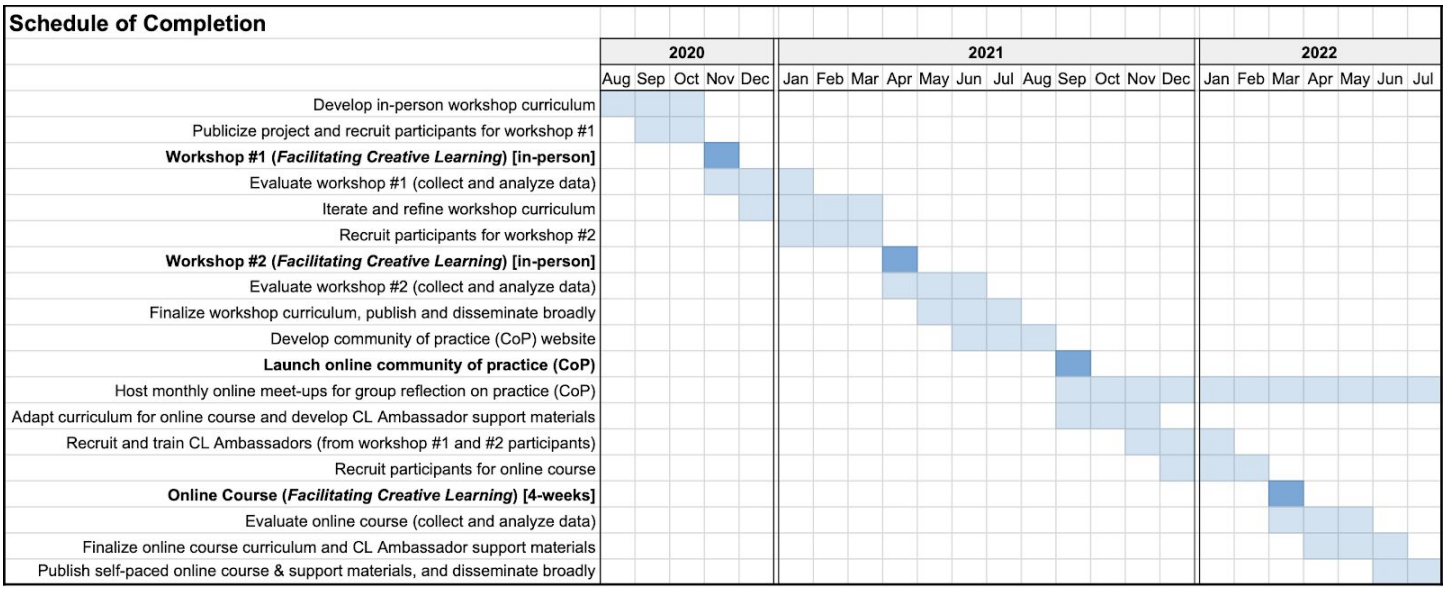


Figure 1: Schedule of Completion

Theory of Change

The primary goal of this project is to build capacity for library professionals to develop creative STEM programs in their libraries by leveraging a creative learning approach to facilitation. If successful, this project will have a twofold effect. First, librarian professionals who participate in the proposed training and accompanying CoP will learn new skills and experience a change in practice as evidenced by some or all of the following outcomes:

- Increased self-efficacy for running STEM learning opportunities for patrons
- Perception of lower barriers to begin or increase STEM programming

- Development of a facilitation mindset (i.e., being comfortable with not being a subject-matter expert, guiding patron interests rather than prescribing or directing patron activities, supporting a diversity of patron-produced artifacts, etc.)
- Experiencing a sense of connectedness to other library professionals who are leveraging a creative facilitation approach to STEM programming
- Sharing and collaborating with other library professionals on the adaptation of STEM learning curricula and resources to align with creative learning principles

These skills and changes in practice will lead to a second, longer-term outcome: supporting patron interest and familiarity with STEM topics. We anticipate that library professionals who participate in the project will not only run more STEM programs, but that these programs will embody creative learning principles in ways that:

- Invite new audiences to participate in STEM learning environments
- Increase access to hands-on, project-based STEM learning experiences
- Take into consideration the interests of learners with rich and varied backgrounds
- Create space for patrons to take ownership over library programming, positioning them as contributing members, rather than passive recipients of library services

Evaluation Plan

The project evaluation seeks to measure library professionals' knowledge of creative learning facilitation best practices, attitudes toward running STEM learning programs in their library, and changes in practice (e.g., integration of creative STEM activities, levels of implementation, etc.) as a result of participating in the project's training workshops and online CoP. Our evaluation strategy consists of assessment of the following: a) participation; b) participant satisfaction; c) participant learning; d) participant change in practice; and e) learner (i.e. patron) experience. Data related to participation, participant satisfaction, and participant learning will be collected through surveys and reflection exercises at the workshops, monthly online meetups, and as part of the online course. In addition, the project team will administer targeted surveys at multiple times throughout the six months following each training workshop. The project team will also collect observation data informing quality of implementation of the training workshops in Cambridge and Macon.

Changes in library professional practice and learner experience will be understood through the analysis of new STEM programs developed by participating libraries and any learning activities that are developed by participants and shared in the online CoP. The project team will collect this data from workshop participants through online surveys, interviews, and analysis of participant produced artifacts. Example topics addressed include: how often do library professionals offer STEM programs that leverage the hands-on nature of physical materials, how often do they participate in a learning activity alongside their patrons (as opposed to prescribing step-by-step patron activities and only observing), how frequently do they encourage patrons to formulate their own questions or bring their own interests into an activity, how diverse a set of patron-created artifacts are produced as a result of the library professional's learning activity prompt, etc. Results across library systems will be explored to determine the overall impact of the project on library staff, as well as differences that may occur between urban, suburban, and rural settings.

Evaluation data collected during all major project activities will be examined by the project team to ensure successful outcomes and allow for project modification, as needed. In addition, evaluation after each in-person workshop and after the online course will be used to inform iterative refinement of the workshop curriculum before broader dissemination. Evaluation results will be shared with the project's partner libraries and advisory board and will be published openly on the project website for community feedback and discussion.

Dissemination Plan

The following project deliverables will be widely disseminated:

1. "Facilitating Creative Learning" workshop curriculum and guidebook
2. An open, self-paced version of the "Facilitating Creative Learning" online course
3. An online community that will be maintained as part of the ongoing PLIX project
4. Support and training materials for the Creative Learning Ambassadors

All materials will be published openly on the project website under a CC BY-SA 4.0 License. This license ensures that project deliverables will be easily accessible, remixable, and adaptable by future users.

Project deliverables will be disseminated broadly among the library and information science community. The project team will leverage professional networks of the 300+ workshop participants; the partner library systems' networks in their region; the advisory board's relationships with the YOUmedia Learning Labs Network and PLA; existing relationships with the Knight Foundation, the Digital Public Library of America, and the Computer Clubhouse Network; and a community of over 250 PLIX librarians from around the country. In addition, the project will also make use of the MIT Media Lab's significant media presence and reach, both in traditional media and, in particular, through social media platforms like Twitter (461.3K followers), Facebook (258.4K followers), Instagram, and LinkedIn. This will help promote the notion of public libraries as key providers of STEM learning in local communities to a broader audience.

Risk Mitigation

The COVID-19 global health crisis presents a big unknown for project planning. In the event that in-person workshops with large numbers of participants are not feasible at the time of project launch, the project team is well-positioned to migrate all workshops online. In addition to its existing experience developing online learning programs, the project team is currently contributing to MIT's efforts to offer all of its courses online.

III. Diversity Plan

In order to ensure that the cohort of workshop participants reflects our values of diversity, equity, and inclusion, recruitment will prioritize under-represented populations in both STEM and the library and information science fields. Specifically, we will enlist the Black Caucus of ALA, The National Association to Promote Library and Information Services to Latinos and the Spanish Speaking (REFORMA), the Chinese American Librarians Association, the Asian/Pacific American Librarians Association, the American Indian Library Association, as well as the Joint Council of Librarians of Color (JCLC) and the American Library Association (ALA) Committee on the Status of Women in Librarianship (COSWL) to ensure there is opportunity for library professionals from all sectors. *(Please note: The project team has started and continues*

to build relationships with these various groups; however, at the time of submitting this proposal, due to issues arising from the COVID-19 global health crisis, we have been unable to secure formal letters of support.)

MIT and our partner library systems, Cambridge Public Library and Middle Georgia Regional Library, are committed to the values of diversity, equity, and inclusion. The PLIX project at MIT is a community partner of the City of Cambridge's STEAM Initiative and has already been working closely with the Cambridge Public Library to foster equity and access in STEAM education, provide high quality STEAM programs, and expand patron participation in STEAM education. Furthermore, many of the libraries in the Middle Georgia Regional Library system serve rural communities, and the project will enlist the Association for Rural & Small Libraries (ARSL) for additional recruitment of rural libraries. The project advisory board member from YOUMedia brings deep expertise on the design and evaluation of equitable and inclusive learning environments to the project. Finally, hosting online workshops will broaden our reach and ensure that this project is able to include and support participants who may not be able to travel.

IV. Broad Impact

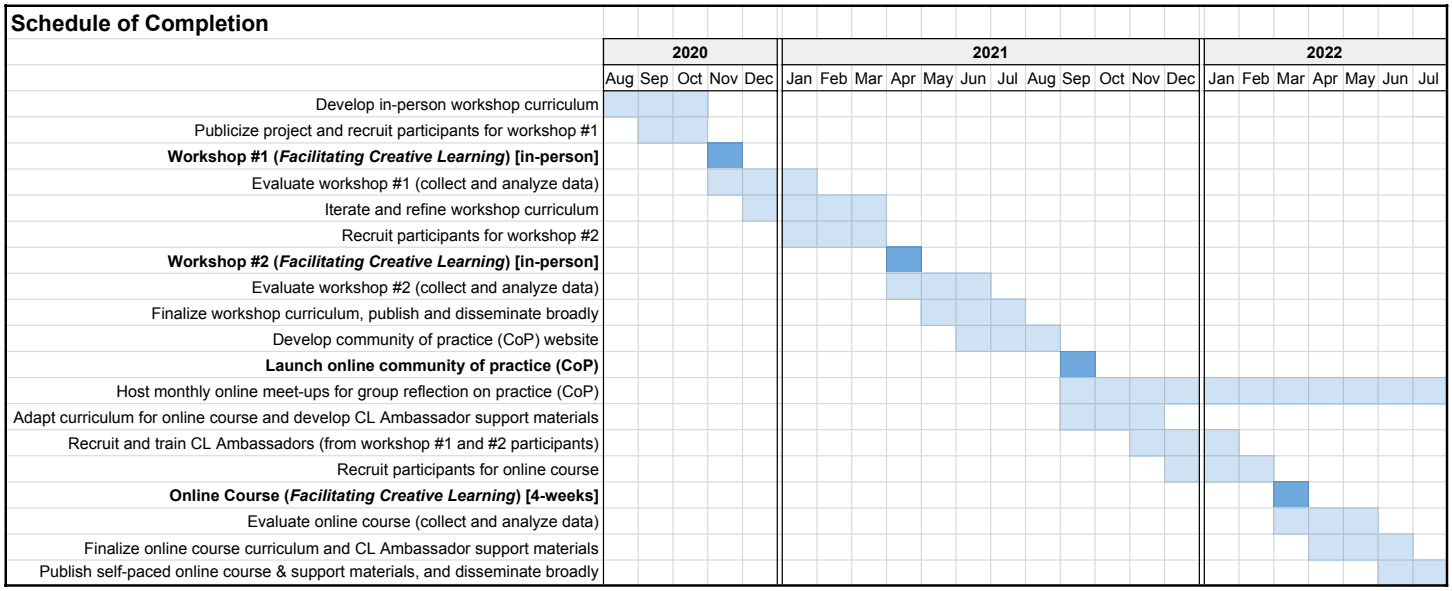
Through two in-person workshops and an online course, the project will directly increase the capacity of more than 300 library professionals to facilitate creative STEM learning programs in their libraries. In addition, a cohort of Creative Learning Ambassadors will be able to translate their experience from this project into developing new STEM programming initiatives in their communities. Finally, an ongoing online CoP will serve a growing network of library professionals introducing a creative learning approach into their STEM programs. These project outcomes will lead to increased access to hands-on, project-based STEM learning experiences for families and individuals of diverse cultural and socioeconomic backgrounds and needs.

In addition to direct impact, all project resources and materials will be disseminated widely and published as open-access resources, enabling reuse and adaptation at no cost. The workshop curriculum will be documented in a guidebook format so that workshop participants or others can lead their own "Facilitating Creative Learning" workshops. A self-paced version of the online course will be made available to members of the public library and information science community who were not able to participate as part of the project. The course will be maintained as part of the ongoing PLIX project, increasing sustainable project impact. The training materials for the Creative Learning Ambassadors will be published to enable other library systems to start their own ambassadors programs. The online CoP will also be sustained as part of the ongoing PLIX project as a resource to disseminate creative learning facilitation practices among library professionals beyond the scope of this grant. It will also provide continuity for a potential future scale-up of this work. Finally, by relying on open-source software and open-access resources, the project team is maximizing the potential for generative growth among new communities and audiences around the world.

Taken together, the activities of this project will not only build capacity in the field of library professionals to implement creative learning programming in their libraries, but will also have a significant impact on library patrons, through broadening access to engaging STEM learning opportunities.

See Supportingdoc3.pdf for the full list of references to the materials cited in this Narrative.

Schedule of Completion



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.

All digital products, other than software code, created during this grant will be published online under a Creative Commons Attribution-ShareAlike 4.0 International (CC BY-SA 4.0) License. Software code will made available under the MIT License (http://opensource.org/licenses/MIT).

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.

Per A1, the Media Lab Learning Initiative will assert ownership over new content for the primary purpose of publishing under an open license. Content and code will be published on openly accessible websites - for content, on plix.media.mit.edu or a similar domain maintained by the Media Lab Learning Initiative, and for code, in GitHub or a similar large, publicly accessible code repository. There will be no conditions or terms imposed on access and use beyond those contained in the relevant CC and MIT licenses, which are both recognized as prime exemplars of open licenses. Users will be notified to the terms of the licenses by direct links to the licenses full text, in the format recommended by the respective license organizations.

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.

Any products created as part of this project will be subject to a terms of service and privacy policy, both of which will be made available from the project's website.

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.

Digital project deliverables will include the following: (1) Facilitating Creative Learning" Workshop Curricula & Guidebook; (2) An open, self-paced version of the "Facilitating Creative Learning" online course; (3) A community of practice website that will be maintained as part of the ongoing PLIX project; (4) Support and training materials for the Creative Learning Ambassadors; (5) Documentation of curriculum development approaches and workshop design evolution. All of these materials will be hosted on a dedicated website maintained by the Media Lab Learning Initiative, with content available in both offline (PDF) and online (HTML) formats. All web-based tools will be based on web standards including HTML, JS, and CSS for the front-end, and leveraging open-source technologies for the back-end.

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.

All content and code will be generated by the Media Lab Learning Initiative's project team, with input from collaborators named in this grant. All content and software will be produced on standard PC hardware. The project's community of practice website will utilize open-source, open-access software tools like Discourse (https://www.discourse.org/) and Unhangout (https://unhangout.media.mit.edu), the latter of which is developed and maintained by the Media Lab Learning Initiative. Some photographic equipment may be used to generate content such as images or video.

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.

The digital project deliverables will be made available both online and offline. All online materials will be developed to adhere to modern HTML5 standards. All printable materials will be print-quality, 300dpi PDFs, appropriate both for color and grayscale printing.

Workflow and Asset Maintenance/Preservation

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

The Media Lab Learning Initiative project team will review all digital project deliverables and workflow annually. Updates to content based on developments in practice or changes in resources will be made as needed. Finally, all content will be co-designed with librarian partners, through a workflow including: consultation with the project's partner library systems, engagement with the project's advisory board, iterative development of workshop curricula that is designed into the project's timeline, collaboration with the project's group of 25 library professional Creative Learning Ambassadors, and frequent calls for feedback from the project's online community of practice.

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).

All materials and assets produced through this project will be maintained as part of the ongoing Public Library Innovation Exchange (PLIX) project (https://plix.media.mit.edu).

Both content and code will be shared on GitHub as openly licensed components that can be utilized by anyone. During the grant period, we will host all content and software on MIT servers or on cloud based infrastructure like Digital Ocean or a similar infrastructure provider. After the grant period, we will ensure that content is hosted and maintained through the same infrastructure as part of the Media Lab Learning Initaitive's ongoing PLIX project.

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).

For online resources, we will use vocabularies from Schema.org (http://schema.org/) and compliment it with LRMI (http://www.lrmi.net/) where appropriate. We will also use the Open Graph Protocol (http://ogp.me/) for marking up online resources to be shared via social media. Code published on GitHub is automatically annotated with metadata including programming language used. In addition, libraries may take other measures to catalog and classify the project in local content systems.

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

Schema.org, LRMI, and Open Graph Protocol metadata will be embedded in the online resources and distributed together. As such, it will be preserved as long as the content is preserved and metadata schemes are used. If the content is updated at a later date, metadata will be updated accordingly.

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).

Metadata will be embedded in online content and discoverable by search engines like Google, Bing, etc. Code published on GitHub can be searched by content and metadata both online and through the API provided by GitHub.

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).

All content and software will be hosted online and accessible via a mobile or desktop web browser supporting the HTML5 standard. It may not be appropriate for all parts of online software to be accessible by anyone for privacy reasons. All software will be hosted on MIT servers or Digital Ocean (or another similar cloud infrastructure provider). Content will be published under the Creative Commons Attribution-ShareAlike 4.0 International license (CC BY-SA 4.0). Code will be published under the MIT License (https://opensource.org/licenses/MIT). Code will be published on GitHub.

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.

Public Library Innovation Exchange (PLIX) project website: https://plix.media.mit.edu
Unhangout, a tool for hosting large-scale, participatory online events: https://unhangout.media.mit.edu
Learning Creative Learning (LCL), an online course & community: https://learn.media.mit.edu/lcl
Media Lab Learning Initiative's GitHub repositories: https://github.com/ml-learning

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.

We intend to create a project website and online community of practice. The website will serve the function of providing public information about our project, as well as be a place to provide information to our audiences of library professionals who might be interested in participating in our project (e.g. by attending a workshop, applying to be a Creative Learning Ambassador, signing-up for and participating in the online course, or joining the community of practice). The community of practice website will be built leveraging existing open-source software (Discourse) for online disucssion forums. It will serve to connect the project's audience of participating library professionals with each other, allowing them to ineract with one another for sharing resources, reflecting on practice, and discussing relevant topics among peers. The community of practice will also include monthly online meetings, utilizing existing open-source software tools, like Unhangout.

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.

A new website will need to be created that is unique to this project. Otherwise, this project will leverage only pre-existing open-source software products and tools (e.g. Discourse and Unhangout).

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.

The website will be created using modern HTML5 standards. The community of practice will leverage existing open-source software for online discussion forums called Discourse (https://www.discourse.org/). Monthly community calls will use an existing open-source software tool called Unhangout (https://unhangout.media.mit.edu), which is developed and maintained by the Media Lab Learning Initiative.

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

All tools created or utilized during this grant will comply with modern HTML5 web standards.

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

All code and instructions for use will be hosted on GitHub. We will only use open source technologies based on open standards that can be reused by anyone with the necessary skills and capable of paying nominal cloud infrastructure costs or provide their own infrastructure like servers, domain names, etc.

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

Iterative process modeled after Agile Software Development practices.

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

Media Lab Learning Initiative's GitHub repositories: https://github.com/ml-learning
Media Lab Learning Initiative's Unhangout repositories: https://gitlab.com/unhangout

Access and Use

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

We will make all code available under the MIT software license, a simple and widely used open-source license.

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

Name of publicly accessible source code repository:

Media Lab Learning Initiative GitHub repository

URL:

https://github.com/ml-learning

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.

Data related to participation, participant satisfaction, and participant learning will be collected through survey, interview and observation at each of the in-person workshops (November 2020 & April 2021), monthly online community of practice (CoP) meetups (monthly September 2021-July 2022), and as part of the online course (March 2022). We will also analyze participant-created artifacts, which could include discussion threads in the CoP, adaptations of existing STEM curricula, responses to reflection prompts in the CoP, and reports on programming offered in participants' local libraries. Evaluation data collected during all major project activities will be examined by the project team to ensure successful outcomes and allow for project modification, as needed. In addition, evaluation after each in-person workshop and the online course will be used to inform iterative refinement of the workshop curriculum before broader dissemination.

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?

Yes, this will require approval from MIT's IRB. If this grant is successful, the project team will apply for approval in the first month of the project (August 2020). More information can be found at https://couhes.mit.edu/.

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.

Data gathered may include PII, such as name, location, and email. All data will be anonymized before public release or permanent storage.

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

Access to standard PC hardware with some type of spreadsheet software application (e.g. Microsoft Excel) will be sufficient.

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?

For survey, interview, and observational data, we will assign study codes to participants and remove personally identifiable information from the dataset. The study codes and identifying information will be kept as a spreadsheet and stored in a separate secure place (i.e., a password-protected folder). Before the interview and surveys, the participants will be given an informed consent form that describes the project and explains how their responses will be used.

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

Evaluation results will be packaged into a series of deliverables, including documentation of curriculum development approaches and workshop design evolution. These deliverables will be shared broadly with the library and information science community as well as shared openly on this project's community of practice website. All resources will be CC-licensed. Data will be archived on the Media Lab Learning Initiative's GitHub repository.

A.7 Identify where you will deposit the data:

Name of repository:

Media Lab Learning Initiative GitHub repository

URL:

https://github.com/ml-learning

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

We will review the data management plan at least twice a year. We will ensure that proper data is being collected from each workshop (in-person and online) and the community of practice, as the data we are collecting will be essential for driving the project forward.

IRS Department of the Treasury
Internal Revenue Service
P.O. Box 35045
Jacksonville FL 32202-0000

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% BASIL A STEWART
77 MASSACHUSETTS AVENUE NE49-3142
CAMBRIDGE MA 02139-4307

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Employer ID Number: 04-2103594
Form 990 required: YES

Dear Taxpayer:

This is in response to your request dated Aug. 29, 2017, regarding your tax-exempt status.

We issued you a determination letter in OCTOBER 1926, recognizing you as tax-exempt under Internal Revenue Code (IRC) Section 501(c)(03).

Our records also indicate you're not a private foundation as defined under IRC Section 509(a) because you're described in IRC Sections 509(a)(1) and 170(b)(1)(A)(i).

Donors can deduct contributions they make to you as provided in IRC Section 170. You're also qualified to receive tax deductible bequests, legacies, devises, transfers, or gifts under IRC Sections 2055, 2106, and 2522.

In the heading of this letter, we indicated whether you must file an annual information return. If a return is required, you must file Form 990, 990-EZ, 990-N, or 990-PF by the 15th day of the fifth month after the end of your annual accounting period. IRC Section 6033(j) provides that, if you don't file a required annual information return or notice for three consecutive years, your exempt status will be automatically revoked on the filing due date of the third required return or notice.

For tax forms, instructions, and publications, visit www.irs.gov or call 1-800-TAX-FORM (1-800-829-3676).

If you have questions, call 1-877-829-5500 between 8 a.m. and 5 p.m., local time, Monday through Friday (Alaska and Hawaii follow Pacific Time).

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Sincerely yours,

Teri M. Johnson
Operations Manager, AM Ops. 3