LAURA BUSH 21st CENTURY LIBRARIAN PROGRAM

Sample Application RE-260065-OLS-26
Project Category: National Implementation

Carnegie Mellon University Libraries

Amount awarded by IMLS:	$226,861
Amount of cost share:	$0

Carnegie Mellon University Libraries will train 140 academic library professionals across seven intensive, week-long cohorts hosted at institutions across the United States. This project addresses a documented and expanding skill gap between the technical needs of modern library services and the coding and AI literacy skills found in the academic library workforce. Each cohort will participate in structured instruction in coding and responsible integration of generative AI, as well as mentored team-based application development to address real-world library operational or workflow challenges. The project will build on existing training methodologies by guiding participants through a complete development cycle, from identifying a real operational problem, through scoping, building, testing, and documenting a working application, within a structured, mentored environment.

Attached are the following components excerpted from the original application.

- Narrative
- Schedule of Completion

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

GenAI Coding for Library Workforce Development

INTRODUCTION

Carnegie Mellon University Libraries is requesting $226,861 in funding for a three-year Laura Bush 21st Century Librarian National Implementation Grant. *GenAI Coding for Library Workforce Development* will train 140 academic library professionals across seven intensive, week-long cohorts hosted at institutions across the United States. This project addresses a documented and expanding skill gap between the technical needs of modern library services and the coding and AI literacy skills found in the academic library workforce. Each cohort will participate in structured instruction in coding and responsible integration of generative AI, as well as mentored team-based application development to create a working application that addresses a real-world library operational or workflow challenge. The project outcomes include the creation of an open educational resource curriculum, a library of reusable code templates, a portfolio of adoption-ready tools developed by participants, and a replicable traveling cohort model, all released under open licenses and disseminated through a culminating multi-cohort symposium, publications, and conference presentations.

PROJECT JUSTIFICATION

An Identified and Growing Workforce Gap

Academic libraries are under growing pressure to deliver increasingly technical services, but technical skills gaps in applied coding and generative AI limit what libraries can implement, sustain, and teach [1–4]. Multiple studies document these skills gaps [5–11]. While academic library job postings increasingly list coding competencies as desired skills [7–9], studies investigating programming instruction within ALA-accredited MLIS programs show preparatory training remains inconsistent and is often limited by core curricula, inadequate student preparation, and institutional capacity to offer and sustain technical coursework [10,11]. Similarly, surveys of academic library employees show relatively low readiness for AI-related work with most respondents reporting little formal preparation or institutional support for building AI competencies [5,6]. Libraries that lack technical expertise struggle to customize, integrate, and maintain open-source tools, meaning that nominally “open” infrastructure remains most accessible to institutions with the strongest technical staffing resources [1,12,13]. These capacity challenges also limit libraries’ effectiveness as partners in research and teaching, including as providers of computational and AI literacy instruction to prepare students for the workforce [2,3,14].

Professional organizations have begun to respond–ACRL published AI competencies for academic library workers in 2025 [15] and academic libraries have attempted to address these issues by articulating AI competency expectations and facilitating upskilling. However, most libraries require structured, sustained development opportunities to meet these increasing technical demands [15–17].

Relationship to Existing Models

GenAI Coding for Library Workforce Development builds on widely implemented training and community building methodologies, such as The Carpentries (including Library Carpentry and Software Carpentry), Code4Lib, and Library Juice Academy. The Carpentries have shown that a foundations-based approach to coding education is effective [18], while Library Juice Academy offers self-paced learning pathways within library-specific frameworks. Code4Lib provides a community-of-practice approach that promotes the sharing of workflows and lessons learned among library technologists. While these models have contributed to an increase in technical skill development for academic libraries, they were not designed to accomplish what this project does: Guide participants through a complete development cycle, from identifying a real operational problem, through scoping, building, testing, and documenting a working application, within a structured, mentored environment. Our implementation-focused approach targets a critical gap between introductory skill-building and the ability to independently produce and maintain working tools. It is designed especially for library professionals whose roles are not primarily technical but who are increasingly expected to engage with technical workflows and instruction.

Generative AI as a Pedagogical Tool

Generative AI tools can lower barriers for learning to code by offering real-time assistance and debugging support [19–21]. In this project, we integrate AI-assisted development as instructional and development support. Rather than writing code from scratch, participants will learn to read, modify, and debug code by

working with AI-generated output. This will enable participants to focus on the overall structure and computational logic of programming while mitigating syntax barriers. Although the integration of generative AI tools into coding instruction has shown promise for accelerating learning [19–21] and building coding confidence [21,22], it has also posed concerns about dependency and integrity, especially in educational contexts [23,24]. To address these challenges, we explicitly teach verification practices (testing, code review, documentation, and safe data handling) while emphasizing code comprehension (reading and explaining AI-generated code) and the importance of human oversight and critical evaluation of AI outputs.

Institutional Positioning

Carnegie Mellon University (CMU) Libraries is well-positioned to lead this project based on demonstrated experience delivering training at national scale. We have documented the need for projects such as *GenAI Coding for Library Workforce Development* through an extensive literature review we published on open science practices in U.S. academic libraries [1]. Our work identified technical skills gaps wherein libraries are increasingly expected to support technical workflows and tools while lacking the in-house expertise to do so. Our Open Science Primer project (IMLS award RE-254818-OLS-23) established the core elements of the workforce development model employed here, including data-driven curriculum design, a traveling cohort delivery format, external feedback mechanisms, and a train-the-trainer approach. The project has delivered five cohorts across four institutions (CMU, Florida State University, Colorado School of Mines, University of Chicago), reaching 112 participants with an additional four cohorts (Johns Hopkins University, North Carolina State University, University of California at Berkeley, and Boston University) scheduled for delivery in 2026. The current proposal extends that model into applied technical training.

The project is led by a team with strong complementary expertise in federal grant management, AI and data literacy instruction, Carpentries-based training, open science programming, and large-scale event and curriculum development. We also bring coding expertise in languages widely used in libraries, such as Python, R, Javascript, SQL, and web development skills, and we have published open educational resources supporting this instruction [19,25,26]. CMU Libraries' Open Source Programs Office, one of the first such offices within a university library, provides institutional infrastructure for software documentation, licensing, and release, directly supporting the open-source outputs of this project.

Beneficiaries and Alignment with Office of Library Services Programs and Initiatives

The primary beneficiaries of this project are academic library workers, including librarians, staff, and other professionals in functional roles such as scholarly communications, data services, digital scholarship, metadata, assessment, systems, and emerging technologies, who need applied coding skills and practical generative AI fluency to implement, adapt, and sustain modern library services. Based on project design, we expect 140 individuals to participate in this project directly. In establishing agreements with host institutions, we will prioritize institutions that are best able to serve library professionals from smaller and geographically isolated institutions where access to technical training is most constrained. Secondary beneficiaries of this project include participants' institutions, which will gain increased internal capacity to build and maintain software-enabled workflows, and the broader library community, which will gain access to open curriculum materials, reusable code templates, and adoption-ready tools developed through this project.

This project is aligned with ***LB21 Program Goal 2 (Train and retain current library and archives professionals, faculty, and staff), Objective 2.1 (Develop or enhance professional development and training programs to enable the library and archival workforce to meet the needs of their communities)***, which is aligned with Agency-Level Goal 1 and Objective 1.2. The project directly addresses this goal by delivering structured, mentored training in applied coding and responsible generative AI integration to 140 academic library professionals across seven cohorts distributed geographically across the U.S. By equipping participants with the independent capacity to build, test, and maintain working tools, the project strengthens the existing workforce's ability to meet the evolving technical demands of their communities.

The project also advances the following OLS priorities articulated in the FY 2026 cover letter:

- *Connecting workers with skills training and the public workforce system (EO 14278)*: This project considers libraries as workforce intermediaries by offering skill-building training that results in concrete

work products. Participants gain career-relevant technical competencies that strengthen their professional capacity to serve their communities as well as their own career mobility.

- *Using new technologies, including generative AI, to improve academic practices (EO 14277)*: This project integrates generative AI as both a pedagogical skill and a development tool while explicitly teaching responsible usage. This equips workers with AI fluency that is required to support responsible adoption of AI in academic library settings.
- *Facilitating rural and remote participation*: The traveling cohort model is designed to reduce geographic barriers by hosting training at institutions distributed across the United States. In formalizing host site agreements, the project team will prioritize institutions that are best positioned to serve personnel from smaller and geographically isolated institutions where access to technical training and implementation support is most constrained.
- *Providing alternative pathways and cutting-edge continuing education (Laura Bush 21st Century Librarian Program)*: The project provides an innovative, competency-based model for library professionals—especially those without formal technical training—to develop applied coding and AI skills. This directly responds to the LB21 Program's interest in exploring alternatives to traditional credentialing and delivering cutting-edge content in continuing education
- *Championing Lifelong Learning by advancing shared knowledge and learning opportunities for all (Agency-Level Goal 1, Objective 1.1)*: By producing openly licensed curriculum materials, reusable code templates, and adoption-ready tools, the project extends its reach well beyond the 140 direct participants. These resources support libraries in their role as learning centers and help bridge the resource and experience gaps that limit technical capacity at institutions with constrained staffing.

PROJECT WORK PLAN

Project Team and Organizational Capacity

The project team is made up of Carnegie Mellon University (CMU) Libraries faculty and staff who provide technical training, consultations, and resources within and beyond CMU [19,26–30]. The project will be led by **Kristen Scotti, Ph.D.**, STEM Librarian at Carnegie Mellon University Libraries. Scotti has authored proposals for and led federally funded research totaling approximately $1 million, including multi-year NASA awards that included software development and management across multiple institutions; she has served as PI on NASA-funded projects and served as chair and panelist on federal grant review panels. At CMU Libraries, Scotti developed "Python for All," one of the first U.S. academic library workshops integrating AI literacy into coding instruction [19], and led the systematized review of open science practices that established the evidentiary basis for this proposal [1]. She chairs CMU Libraries' AI and Open Science Task Force, serves on the Open Science Collaborative of Library and Information Professionals (OSCLIP) steering committee, and serves as a curriculum developer and instructor for the Open Science Primer project. **Chasz Griego, Ph.D.**, STEM Librarian at CMU Libraries will serve as Co-I for this project. Griego is a certified Carpentries instructor, teaches Python programming workshops, and leads reproducibility hackathons that connect students with real research code. He supports open science initiatives at CMU with a focus on reproducibility in computational research and serves as a curriculum developer and instructor for the Open Science Primer project.

Key personnel for this project include:

Nicky Agate, Ph.D., Associate Dean for Academic Engagement at CMU Libraries is PI of the IMLS-funded POEM project ($165,000, LG-256607-OLS-24) on AI and data literacy and has served as co-PI on Mellon and Hewlett Foundation grants totaling over $2.9 million. She also serves as a curriculum developer and instructor for the Open Science Primer project. For this project, Agate will contribute to curriculum development, instruction, and mentoring, while also facilitating commitments from host institutions and contributing her grant management expertise.

Melanie Gainey, Ph.D., Senior Librarian and Director of CMU Libraries' Open Science Program, served as co-PI on the Open Science Primer grant (IMLS award RE-254818-OLS-23, $241,147) and is a certified Carpentries instructor who coordinated Software Carpentries at CMU from 2018–2024. Gainey organizes CMU Libraries' bioinformatics hackathon series, the Open Science Symposium, and also serves as a curriculum developer and instructor for the Open Science Primer project. For this project, Gainey will contribute to

curriculum development, instruction, and mentoring, while also contributing her grant management experience and her event planning expertise to the culminating symposium.

Thomas Hughes, M.A.M., Community Manager for CMU's Open Source Programs Office, brings a decade of experience bridging technical and non-technical communities. Hughes has nine years of experience working with CMU faculty, staff, students and external guests to ideate, plan, and implement workshops and symposia that focus on exploring emerging technologies and producing open-source outputs; he also serves as a curriculum developer and instructor for the Open Science Primer project. For this project, Hughes will contribute to curriculum development, instruction, and mentoring, while specifically addressing the open-source software output aspects of this project.

Joelen Pastva, M.L.I.S., is Director of Library Services at Carnegie Mellon University Libraries. Pastva oversees Access Services, the Digitization Lab, and Resource and Discovery Services. She led CMU Libraries' implementation and ethical assessment of the Keenious AI recommendation tool and co-authored the resulting case study on AI implementation in academic libraries as part of an IMLS-funded Responsible AI project (IMLS award LG-252307-OLS-22) [31]. For this project, Pastva will contribute to curriculum development, instruction, and mentoring, while also contributing her operational expertise to the development of the problem bank that will be produced in this work.

Sarah Young, M.L.I.S., is a Principal Librarian and Director of the Evidence Synthesis Program at CMU Libraries. Young holds a graduate certificate in program evaluation and served as the lead evaluator on the Evidence Synthesis Institute IMLS award. She is also a certified Carpentries instructor and teaches workshops on tools for citation management, data cleaning and data analysis in R and provides methodological expertise for evidence synthesis across disciplines. Since 2021, Young has served as co-organizer and trainer for the Evidence Synthesis Institute, a formerly IMLS-funded biannual training program for librarians in evidence synthesis methods, which has trained over 500 librarians since its inception in 2020 and was recently awarded the ACRL University Libraries Section's Outstanding Professional Development Award. For this project, Young will contribute to curriculum development, instruction, and mentoring, while also contributing her expertise to execution of the evaluation plan for this work.

Stakeholder Engagement

This project was developed through sustained engagement with the professional communities it is designed to serve. In particular, we have integrated feedback and lessons learned through the Open Science Primer and other professional development programs that CMU Libraries has supported (*e.g.*, OSCLIP and the CMU-organized Cracking Open Unconference) into our instructional approach, including emphasizing practical tools and workflows relevant to participants' local contexts and providing increased opportunities for professional connections and peer learning. This focus on relevance to local contexts is evident in the capstone model, wherein participants work in teams to develop tools or workflows to meet their institutional needs. Host institutions (see Supporting Documents 2-7) and members of the Code4Lib and OSCLIP communities will also be consulted during the brainstorming, design, and development of the project's problem bank (described in Phase 1), ensuring that sample challenges and use cases are grounded in the operational realities, priorities, and technical capacities of participating libraries. Professional connection is further supported through sustained collaboration on capstone projects and through the multi-cohort symposium, which creates structured opportunities for peer learning. Informal community learning, engagement, and feedback will also be supported through a project discussion group that we will host on Slack.

Two external evaluators with relevant experience in curriculum design and academic library professional development—Pete Lawson, Ph.D., Data and Visualization Librarian, Johns Hopkins University Sheridan Libraries, and Hannah Sutherland, M.L.I.S., Open Science and Collections Librarian, University of California, Los Angeles—will review the curriculum and provide feedback on its scope, learning outcomes, and structure. Letters of support from these evaluators are included in Supporting Documents 8 and 9. The project team will further consult with the CMU Eberly Center for Teaching Excellence & Educational Innovation, seeking feedback throughout curriculum development to ensure the training is widely adaptable. Stakeholder input will continue to inform curriculum development, project delivery, and evaluation throughout the project period.

Program Structure
Carnegie Mellon University Libraries will deliver *GenAI Coding for Library Workforce Development* as a three-year national implementation project structured across four phases: (1) needs assessment and partnership building, (2) program and curriculum development, (3) delivery of seven week-long, in-person traveling cohorts at host universities, and (4) evaluation, dissemination, and a culminating multi-cohort symposium.

Each cohort will follow the five-day, in-person format. On Days 1-2, participants will receive structured instruction and guided practice in applied coding and the use of generative AI as a development tool. Days 3–5 shift to mentored team application development ("build days"), where participants work in small teams on a capstone project; that is, a working application or workflow automation component that addresses a real library operational challenge. Each team will be assigned a CMU mentor whose role is to guide problem-solving rather than provide direct solutions, building participants' independent capacity to navigate technical challenges. Capstone project brainstorming will begin before the cohort week to ensure productive use of build days. By week's end, teams are expected to have a working prototype with initial documentation and a development plan. This in-week output serves as a foundation; teams continue refining their projects through monthly mentor check-ins in the weeks between their cohort and the culminating symposium.

By the end of a given cohort week, participants will be able to:

(1) Interpret, modify, and debug code in at least one programming language.
(2) Use generative AI to accelerate coding tasks while evaluating generative AI outputs using systematic verification practices (including testing, code review, validation, debugging, documentation, and data handling safeguards).
(3) Analyze and communicate data privacy, licensing, and reproducibility implications of the use of AI-generated code and propose appropriate mitigations.
(4) Design, implement, and document a working prototype that addresses a real-world workflow automation challenge in an academic library context.
(5) Apply open-source development practices including version control, licensing, adoption-oriented documentation, and sustainability plans.

Final deliverables presented at the symposium are expected to meet the following adoption-quality standards to ensure applications are realistically deployable outside of the original project context. These standards include:

(1) A working, runnable tool that executes end-to-end on non-sensitive sample data,
(2) A documented installation process (e.g., local, containerized, or hosted) with stated prerequisites,
(3) User documentation, including a "quick start" guide,
(4) Developer documentation that describes configuration, dependencies, and maintenance,
(5) A testing approach appropriate for project complexity,
(6) Licensing and provenance documentation, including a record of generative AI use and verification steps taken, and
(7) Implementation notes that include hosting options, data-handling constraints, and a software sustainability plan.

CMU's Open Source Programs Office (key personnel: Thomas Hughes) will support packaging, documentation, licensing choices, and release checklists to ensure outputs align with best practices in open-source software development and can be adopted by libraries with varying technical capacity.

Phase 1: Needs Assessment and Partnership Building (September 2026 - November 2026)
The project team will conduct a targeted needs assessment to identify the programming languages, tools, and automation workflows most relevant across academic library contexts. This assessment will build on the needs assessment conducted during the Open Science Primer project, using job postings, literature review, and consultation with professional communities to address the scope and context of the *GenAI Coding for Library Workforce Development* project. This needs assessment will inform curriculum prioritization and ensure instruction targets skills with broad applicability.

Concurrent with the needs assessment, we will formalize agreements with six host institutions for program delivery. We have secured letters of support from University of Nebraska–Lincoln, University of Iowa, University of Oregon, University of San Diego, Brandeis University, and Claremont Colleges confirming their interest in serving as host sites (see Supporting Documents 2–7). As a risk-mitigation strategy, we will also maintain a pool of alternate host institutions through our professional networks and relationships we have built through the Open Science Primer (which secured seven host sites) such that, if a selected host withdraws, a replacement can be secured promptly without substantially affecting the project schedule or regional representation. Each host institution will designate a host coordinator who will be responsible for supporting local logistics and communication with our facilitation team.

We will implement regional recruitment strategies that include targeting smaller and geographically more dispersed institutions. Recruitment strategies may include advertisement through professional listservs, regional consortia, state library networks, and direct outreach via host institutions and their partner or neighboring institutions within the region that may serve as participant referral sources. Applicants will submit a short statement of institutional context and need, their role and current responsibilities, and prior technical experience (including “none”). Participant selection criteria will be designed to take into consideration institutional need and geographic dispersion, while also considering the development of capstone teams, balancing participants across roles, experience levels, and functional areas.

To support the capstone development component of the project, we will curate a “problem bank” of library workflow challenges scoped for completion within the project delivery period. Problems will span functional areas, potentially including metadata remediation, data transformation, collection analysis and management, usage and expenditure tracking, service optimization, API integration, assessment reporting, digital scholarship support, and scholarly communications workflows; specific areas will be chosen based on the results of our needs analysis and discussions with stakeholders (described in Stakeholder Engagement). Problems will range in complexity to ensure that participants of all levels of prior preparation can work on a challenging but within-reach problem. For each problem identified, we will include: (1) a minimum viable product definition, (2) sample datasets (where possible), (3) code templates that can be modified (4) recommended implementation routes, (5) known constraints (*e.g.*, data privacy, hosting limitations), and (6) a release-ready checklist that specifies minimum requirements for sharing and reuse. This scoping guidance is included to better enable cohorts to produce adoption-ready tools within the project timeline. While participants will not be limited to working on one of the identified problems, this bank will help mitigate potential risks associated with participants experiencing difficulty identifying appropriate problems to work on. Assembling the problem bank will span Phases 1 and 2.

Phase 1 Deliverables include: host site commitments and cohort calendar, participant recruitment and selection rubric, and a preliminary capstone problem bank and scoping guidance.

Phase 2: Program Development (November 2026 - April 2027)

The project team will develop the modular curriculum and supporting materials for the five-day cohort format described above. Instructional materials for Days 1–2 will cover:

- Foundational coding concepts including data types, control flow, functions, and libraries (contextualized through library workflow examples such as batch metadata transformation and file manipulation).
- Using pseudocode to plan AI-assisted coding projects, where participants will translate a workflow into clear step-by-step logic before generating code. Using pseudocode as a structured prompt for generative AI has been shown to produce more accurate code through the reduction of ambiguity and errors [32,33].
- Best practices in open-source software development, including version control, licensing, documentation standards, and maintenance [34–36].
- Guided practice using generative AI for coding tasks, spanning entry points such as formula generation in Google Sheets to Python scripting for data processing and API integration.
- Guided practice modifying an existing open-source library application to meet a specific local use case, emphasizing verification, testing, and safe data handling throughout.

As described above, in addition to instructional materials, the team will develop starter templates and reusable code repositories for common library automation workflows (e.g., metadata transformation, tabular data processing, API integration, basic web interfaces), each with documentation, testing checklists, and packaging guidance. For Days 3–5, the team will develop a facilitator guidebook, team project charter templates, milestone checkpoints, and a mentoring guide that defines the mentor role and establishes protocols for in-week and post-cohort engagement.

We recognize that participants are likely to enter the program with widely varying levels of programming experience–this is a common dynamic in the coding workshops we regularly teach. We will address this intentionally through the curriculum design, group assignment, and layered supports. A virtual orientation session will be held approximately one week prior to each cohort instruction week to introduce the program structure, share pre-workshop instructional materials (designed to establish a common baseline for all participants), and provide assistance with any required software installation or set-up. Instructional materials will be structured to support novice learners by providing clear explanations and guided practice. Early instruction will begin with a low-barrier Google Sheets exercise in which participants use generative AI to help write a formula, giving those with less coding background an immediate, practical success experience. Based on our experience running coding workshops, capping participants at 20 per cohort with four instructors allows for individualized support throughout hands-on activities. Groups for the capstone project will be assembled such that participants with differing strengths and levels of coding experience work together (where skills are assessed *via* survey prior to the cohort instruction week). Small group structures further balance variances in prior coding experience by allowing participants to contribute different forms of expertise, including subject knowledge, workflow knowledge, assessment, documentation, and coding. Lastly, pre-workshop orientation materials, the “problem bank”, mentored build days, and post-workshop mentoring and check-ins will provide multiple levels of support for participants of all starting knowledge levels.

All materials will be piloted with external reviewers and host institution coordinators prior to the first cohort and revised based on structured feedback.

Phase 2 Deliverables include a curriculum package including instructional outlines, guided exercises, and assessment tools; starter templates and reusable code repositories for common library automation workflows, each with documentation, testing checklists, and packaging guidance; facilitator guidebook; and mentoring guide defining the mentor role, communication protocols, and milestone checkpoints for both in-week and post-cohort engagement.

Phase 3: Program Delivery (May 2027 - September 2028)

Seven cohorts will be delivered as week-long, in-person workshops at host institutions with regionally recruited participants. The first cohort, held at CMU's Pittsburgh campus, will serve as a structured pilot; facilitated debriefs and participant feedback will be used to refine materials before subsequent delivery. Remaining cohorts will be scheduled at four-to-six week intervals to allow iterative refinement between deliveries; host institution agreements will be finalized during Phase 1. Consistent with IMLS priorities, we will maintain dedicated participation pathways for library professionals from institutions serving rural and remote communities, where access to technical training and implementation support is most constrained.

Each cohort will be capped at 20 participants (total 140 participants across all cohorts), organized into four groups of five participants per cohort, with one instructor assigned to each group for the “build days” (described in Program Structure). This design is aligned with cooperative and collaborative learning research which shows that smaller groups (3-5 participants) generally support stronger participation and better learning outcomes [37–39]. No fees will be charged to participants nor their institutions, and at least ten travel stipends will be offered (see Budget Justification). To receive a travel stipend, participants would need to demonstrate a need to fly or drive over two hours to attend an in-person training. Stipend applications will be reviewed based on total estimated travel costs to attend training and the availability of professional development support at their institutions.

Phase 3 Deliverables include: seven delivered cohorts and a portfolio of team-developed, adoption-ready tools with documentation.

Phase 4: Evaluation and Dissemination (November 2028 - August 2029)

Symposium*:* A two-day symposium at Carnegie Mellon University's Pittsburgh campus will be organized to bring together all seven cohorts at the end of the project period. Day one will be used for capstone project presentations and structured peer discussions. Day 2 will be organized as an "adoption clinic," where participants work through what it would take to deploy a tool developed by another cohort at their own institution. No fees will be charged to participants nor their institutions, and at least ten travel stipends will be offered (see Budget Justification) using the same criteria as described for awarding travel stipends for instruction cohorts.

Evaluation Plan: We employ a mixed-methods evaluation approach organized within the Kirkpatrick Model of training evaluation [40], a widely used framework for evaluating workforce development programs. Evaluation is structured across four levels, including: (1) reaction (assessing participant satisfaction and engagement), (2) learning (measuring knowledge and skill acquisition), (3) behavior (tracking application of skills in the workplace), and (4) results (evaluating broader impact to organizations and communities). This framework aligns our three evaluation components: (1) learning objectives (Kirkpatrick level 2), (2) implementation outcomes (Kirkpatrick levels 3 and 4), and (3) process evaluation (Kirkpatrick level 1) into an evidence-based evaluation plan. All evaluation activities will be conducted with Institutional Review Board approval from Carnegie Mellon University.

Learning outcomes. Pre- and post-surveys will be used to measure changes (if any) in coding confidence and generative AI literacy. Surveys will be administered at the start and end of each cohort week and again six months after participation. To assess coding confidence, we will adapt the Computer Programming Self-Efficacy Scale (CPSES) [41] such that the questions reflect the library-centered programming this project adopts. CPSES is a validated instrument that measures self-efficacy across five domains, including: logical thinking, algorithm design, debugging, control structures, and collaboration and was designed to accommodate respondents across a range of experience levels. We will adapt the Meta AI Literacy Scale for assessing AI literacy (MAILS) [42]. This framework assesses AI literacy across five domains, including usage and application, understanding, detecting, ethics, and self-efficacy and provides a modular design that will allow us to use subscales most relevant to our learning outcomes (usage and application, ethics, and self-efficacy). Additionally, we will supplement MAILS with items adapted from the Perceived AI Literacy Questionnaire (PAILQ-6) [43], which is a six-item instrument validated with adults and is suitable for repeated administration. Pre- and post-survey data will be analyzed using paired-sample t-tests and effect sizes will be reported for all comparisons. The follow-up survey data will be compared to the post-survey data to assess retention of learning gains (if any).

Implementation outcomes. Capstone artifacts will be evaluated using a rubric that operationalizes the seven quality standards described in the Program Structure section. Each standard will be assessed using a four-point scale (1 = Not Met, 2 = Developing, 3 = Proficient, 4 = Exemplary). Each capstone will be independently scored by at least two external evaluators and inter-rater reliability will be established using Cohen's kappa [44] (letters of support from evaluators are provided in Supporting Documents 2 and 3, and travel expenses for external evaluators' attendance at the symposium is described in the Budget Justification). We will track adoption and reuse through repository analytics (forks and downloads) and through self-reported deployment data collected at the six-month follow-up and at the symposium.

Process evaluation. Participants will complete end-of-week surveys assessing satisfaction, perceived relevance, and instruction quality. Survey items will be adapted from The Carpentries post-workshop survey [45]. We will also conduct structured debriefs with host coordinators within two weeks of each cohort's conclusion. Debrief notes will be coded and synthesized.

Reporting. We will produce a mid-project formative evaluation report after Cohort 3 and a summative report at the end of the project. The formative report will synthesize process evaluation findings and early learning outcome data and will be used for iterative refinement of the curriculum. The summative report will provide findings across all three evaluation components. Recommendations for replication and lessons learned will be included in both reports and these reports will be disseminated as described in Project Results.

Phase 4 deliverables include: Culminating symposium, formative and summative evaluation reports, and curated showcase of cohort outputs hosted through CMU's institutional repository.

PROJECT RESULTS

Intended Results and Deliverables

The *GenAI Coding for Library Workforce Development* project will produce six categories of deliverables, each designed to address a specific dimension of the workforce capacity gaps documented in the Project Justification:

- A **replicable traveling cohort model**: We will document this model through the dissemination of a host checklist, recruitment templates, session schedules, and a facilitation guide. MLIS programs alone cannot be expected to close the technical skills gap; thus, the library profession needs workforce development infrastructure that can operate at scale and persist beyond any single grant. This model is designed such that host institutions can replicate the program independently after the grant period ends.
- An **open educational resource curriculum package** including instructional materials for teaching applied coding for library workflows and responsible generative AI-assisted development. These materials will include: instructional outlines, guided exercises, facilitator notes, and assessment tools. This curriculum will directly address AI literacy and technical skills gaps by teaching both the practical skills and the critical judgment needed to use AI tools competently in a professional context. All materials will be licensed for open reuse and adaptation.
- A **library of reusable open-source starter templates and code repositories** aligned to common library workflows, including metadata remediation, data transformation, collection analysis and management, usage and expenditure tracking, service optimization, API integration, assessment reporting, digital scholarship support, scholarly communications workflows, and lightweight web interfaces. One of the core problems identified in the literature is that open-source tools are nominally available to all libraries, but in practice are most accessible to institutions with strong technical staffing. These templates, paired with clear documentation and implementation guidance, are designed to lower that barrier, giving libraries with limited in-house expertise a realistic path to customizing and maintaining open-source infrastructure. The project team commits to sustained maintenance and updating of these repositories for five years post award period.
- A **portfolio of cohort-developed, adoption-ready tools** representing real workflow challenges from participating institutions, each accompanied by documentation, testing notes, and maintenance guidance.
- A **multi-cohort culminating symposium and published showcase hub**, providing a record of project outputs and facilitating cross-institutional adoption of developed applications.
- A **program evaluation report and implementation guide** assessing workforce learning and implementation outcomes and enabling replication of the cohort model by other institutions.

Dissemination Plan

Project outputs and findings will be disseminated through peer-reviewed publications and presentations at library-related conferences (e.g., ALA Annual, ACRL, Code4Lib, and the DLF Forum). A phased dissemination strategy will be used. In Year 2, we will deliver at least two conference presentations to share results from the needs assessment; these presentations will also serve to recruit participants for subsequent project work. Final project outputs and findings will be shared in Year 3, also targeting at least two conference presentations. Our Open Source Programs Office will help disseminate cohort-developed applications through open-source software repositories and sharing platforms. Similarly, we will submit at least one peer-reviewed, open access publication reporting results of the needs assessment and one publication describing the curriculum design, pedagogical model, and reporting evaluation findings. All of the curriculum materials, facilitator guides, starter templates, and code repositories will be licensed under an open license and hosted through Carnegie Mellon University's institutional repository. Additionally, a guide for replication of the research design, including recruitment, facilitation, and mentorship structures, will be disseminated to enable other institutions to facilitate similar projects beyond the scope of this grant. Symposium presentations will be recorded and published alongside the showcase hub.

Sustainability

The structure of the *GenAI Coding for Library Workforce Development* project is designed to sustain impact through three mechanisms. The first mechanism involves the application of a "train-the-trainer" model to enable participants to both apply what they have learned to their own contexts, but also be able to facilitate similar training within their own institutions and networks. Secondly, all curriculum materials, templates, and code repositories will be openly licensed and maintained in CMU's institutional repository to facilitate long-term access and reusability; CMU Libraries commits to maintaining these resources for a minimum of five years after the grant period. The project team commits to sustained maintenance and updating of the library of reusable open-source starter templates and code repositories for five years post award period. Lastly, we will pursue integration with existing professional development and community infrastructure (***e.g.***, OSCLIP, where two members of the project team serve as steering committee members, and Code4Lib) to support ongoing program delivery, peer support, and continued dissemination of cohort-developed tools and implementation lessons learned.

REFERENCES

Full references supporting the citations in this project narrative are provided in Supporting Document 1.

Schedule of Completion