Open Educational Resources on Algorithmic Literacy

Hosted by Cornell University Library

Project Summary

In application to the Laura Bush 21st Century Librarian Program, Cornell University Library requests $149,901 for an 18-month planning grant to support the creation and distribution of Open Educational Resources (OER) on algorithmic literacy, primarily for library instruction but with broader applications. The project will support the professional development of library and archive professionals by teaching library workers algorithmic literacy, providing them educational resources, and training so that they can teach others about the role algorithms play in information access and production. Our project aligns with the Program's goals and objectives: to serve the information needs of our communities (Objective 3.2), to provide self-directed learning opportunities and build training programs for library workers (Objective 3.3), and to teach digital literacy (Objective 3.4).

We aim to provide OER that will address gaps in knowledge about how algorithms affect the information pipeline. We will develop a strategic plan to facilitate the creation of materials that are modular, dynamic, and adaptive, while prioritizing accessibility, sustainability, and the needs of our communities. Many libraries offer workshops on digital tools, social media, and privacy practices, and thus library staff accustomed to teaching these components of information literacy are well-positioned to assess curricular gaps related to algorithmic literacy.

This planning project will conduct participatory user research about current understandings of algorithms and educational needs related to algorithmic systems. It will then assess best practices for an algorithmic literacy package containing off-the-shelf curricula, online learning objects, and assessment tools.

Project Justification

Background and Project Rationale

Algorithms and algorithmic systems increasingly play a critical role in our material and digital lives. From search engines to social media, bank loans to policing, algorithms determine what information is prioritized, discovered, and utilized by both individuals and artificial intelligence in decision-making. As evident in current discussions about ChatGPT, artificially intelligent chat services powered by machine-learning algorithms have huge implications for the research process, academic integrity, intellectual freedom, and information access.

Despite their centrality to our contemporary information society, there is surprisingly little public knowledge of algorithms. Algorithms tend to exist in "black boxes," which conceal them from scrutiny and contribute to a lack of public understanding of their processes. However, a growing number of scholars, nonprofits and advocacy groups are helping to expose the implications of algorithmic decision-making. Building on this important work, we aim to identify the emerging issues and educational gaps around algorithms and to empower library workers to teach and employ algorithmic literacy. Libraries have long taught their patrons a set of key skills, known as information literacy, including how to find, evaluate and use information. However, algorithms demand a new kind of literacy. As they continue to influence our current information landscape, algorithms reveal the need for creating new curricula that can address newly urgent questions: What are algorithms, and how do they work? How do digital algorithms compare to analog rules for solving problems through a series of step-by-step instructions? What, if anything, can be known about specific algorithms, and what distinguishes one type

of algorithmic system from another? Above all, how do algorithms shape information access, and what agency might libraries exert in increasing algorithmic literacy?

Library budget constraints can make receiving training on emergent topics in Library and Information Science (LIS) and creating educational resources challenging. Thus, the aim of our project is to provide openly accessible resources to use in public programming, classroom instruction, and staff trainings. Please refer to our three letters of support from specialists in digital privacy, critical information literacy and the social effects of algorithmic systems for additional perspectives on our project's potential impact.

Preliminary Research

Research in media studies, computer science, information science, sociology, and science & technology studies has documented how algorithms shape information access and how they affect the lived experiences of communities. Libraries have developed countless infographics, workshops, and tutorials related to evaluating information and countering disinformation, but more needs to be done incorporating algorithms into our information literacy programming. According to a recent report from Project Information Literacy, instruction about algorithmic systems is largely insufficient, and library patrons, especially students, are left needing more substantive and accessible resources. While patrons are generally aware of the existence of algorithms, they often do not know how algorithms work and how they relate to data collection and surveillance. Beyond the immediate reach of social media, algorithms readily influence not only everyday information access but also information production.

As research indicates, algorithms affecting information access and production have had broad impacts on publishing and information markets. These systems are powered by financial incentives and thus, they are less concerned than libraries with providing accurate information (Noble, 2018). Research on how algorithms usage in academic publishing demonstrates how these systems influence access to research and the kinds of research that gets published, which has huge ramifications for higher education, scientific research, and general information production (Gendron et al., 2022). Digital news media outlets revenue now depend largely on advertising sales, manifested in online trackers, cookies, and data collection, of which "clickbait" coverage is often used to increase web traffic (Lamdan, 2022). Research on social media platforms has shown that users are more likely to interact with web content if it elicits an emotional response (Kramer, et al. 2014). These attempts to monetize information are complicated by the consolidation of information markets, and library vendors becoming key players in data markets by collecting, aggregating, and brokering data, including patron data (Lamdan, 2022).

Recent discussions of artificial intelligence (AI) and chatbots have raised questions of how libraries will use AI in the future. Any sustainable answer depends on understanding how AI works (Lund and Wang, 2023). Algorithmic literacy offers an essential framework for evaluating use-cases and the possible ramifications of AI powered by machine learning algorithms. Chatbots like ChatGPT are notorious for creating false information, which will likely affect reference work, as reference librarians will be asked to chase down non-existent citations. Other recent research shows how critical algorithmic literacy is to library work. As information institutions, libraries, higher education, and K-12 are increasingly under attack by disinformation campaigns powered by algorithms, particularly preferential algorithmic systems, which "can reinforce their users' existing biases and beliefs." (Esmail, 2023).

Research and advocacy groups such as the Algorithmic Justice League, and the Distributed Artificial Intelligence Research Institute provide good examples of community-engaged research that aims to raise awareness and transparency about algorithmic harms. The educational outputs of these organizations include their research articles, data visualizations, discussions panels, and white papers. Our work

complements these efforts by specifically crafting resources intended for use in classrooms and libraries by audiences who have little experience with digital or data literacy. Please see our supplemental References document for details on the cited sources.

Broad Impact

"Algorithmic Literacy is needed," Michael Ridley and Danica Powlick-Potts argue, "to acknowledge both the technology's power (control) over people and power (empowerment) of people." Libraries are a natural place for cultivating algorithmic literacy not only because of their longstanding history of helping patrons with emergent technology and other literacy skills. At present, algorithms are constitutive of information, and thus, algorithmic literacy is information literacy. This OER project will provide resources targeting both public and academic libraries, which presents both challenges and opportunities to be addressed in the planning stage. In both contexts, an information literacy program centered on algorithmic literacy aims to give patrons the tools and skills needed to be better digital citizens. Materials will be given Creative Commons licenses wherever possible, so that they can be adapted for use in K-12 schools and other educational settings.

While recent research in LIS has addressed the ways in which algorithms and algorithmic systems are shaping information access, this project will create real-world applications for this research. In particular, it will expand on instructional materials within LIS on disinformation and information evaluation, which encourage patrons to think critically about the information they access and the process through which they are accessing it. Our broad social and cultural understanding of "algorithmic literacy" exceeds limited technical definitions and enables a holistic approach to teaching how ideas spread, how our digital landscape shapes information access, and how the technical information pipeline connects to culture and society. Adopting a bottom-up, holistic approach, we aim to start with lived experiences of communities in the digital age, providing opportunities for library workers and patrons to critically reflect on knowledge production and to gain a better understanding of the information ecosystem.

There are currently very few resources, and no reliable OER, on algorithmic literacy for librarians. Previous resources have tended to be highly specialized with access restricted behind paywalls, which has prevented them from reaching communities that are most affected by algorithms. A quick search on "algorithms" in the popular repositories OER Commons and MERLOT yields a handful of lesson plans and modules from sources like WikiBooks and Khan Academy. However, they focus on the computational processes and mathematical concepts needed to design and build algorithms, and not on the critical and conceptual skills needed to understand algorithmic systems and their social impact on decision-making and information access. While the funding will help offset the costs for producing, distributing, and sustaining these materials, Creative Commons licenses will ensure that the individuals and institutions involved in their creation are credited for their work, and that library workers and patrons can continue to adapt and remix this work in the future.

As outlined above, algorithms impact the lives and futures of our communities, as they are employed to make decisions that affect the livelihoods of the communities that libraries serve. Additionally, algorithms shape information access both on the internet and on-site at libraries, and thus understanding their processes is critical not only to meeting the needs of our communities but also to library work as a whole in the 21st century. Algorithmic literacy is critical for both patrons and library workers, but educational materials that address these topics are lacking. This project aims to meet the need for materials. In particular, OER created by this project will provide training for library workers and patrons that will cultivate critical thinking skills, especially those related to evaluating information and information

ecosystems, and advance digital inclusion by providing education about technology platforms, digital infrastructure, digital literacy, privacy, and data justice. By offering professional development opportunities for library workers and educational materials for library use, this project aims to address systemic issues in our communities and empower patrons and library workers to better understand and advocate against bias in information access.

Project Work Plan

Project Goals

This project has two key deliverables: 1) an assessment report detailing current needs for algorithmic literacy resources and outlining key strategies for algorithmic literacy OER dissemination; 2) three instruction module prototypes for "algorithmic literacy packages" containing off-the-shelf curricula, online learning objects, and assessment tools. The project will consider best practices for offering adoption grants and translation services to make materials easily accessible for community-specific needs.

Project Team

- Sponsoring Principal Investigator will serve in an *advisory capacity only.* They will serve on the project advisory council and will advise project directors (Esmail and Burgos) about meeting institutional administrative requirements.
    - Bonna J. Boettcher is Associate University Librarian at Cornell University, where she oversees most of the unit libraries, and serves as Adjunct Professor of Music. Boettcher also serves as Director of the US-RILM Office, and has been active in the Music Library Association, holding the offices of Executive Secretary, Convention Manager, and President. Her research interests include digital humanities, library administration, and fictional representations of music and musicians.
- Co-Primary Investigators serve as the project directors and will oversee all project work, research, and administration.
    - Iliana Burgos is the Emerging Data Practices Librarian at Cornell University, where she supports digital humanities and research data management services guided by open scholarship principles. A Ronald E. McNair Scholar and American Library Association Spectrum Scholar, Burgos previously worked in community outreach roles at the Wilmington Institute Free Library of Delaware and the University of North Carolina at Chapel Hill. Her research interests include text data literacies, critical platform studies, and community-based data justice movements.
    - Reanna Esmail is the Lead Librarian for Instruction at Cornell University, where she oversees Olin Library's information literacy program and serves as the subject specialist for ethnic studies and undergraduate research programs. As a Minnesota Institute alum and a writer for ALA's Office of Intellectual Freedom Blog and American Libraries Magazine, Esmail's research interests include intellectual freedom, targeted online harassment self-defense, data brokerage, and algorithmic literacy.
- Additional team members:
    - Open Educational Resources Leads will work closely with the Primary Investigators on parts of the project related to OER accessibility, creation, and discoverability. They will help create structured survey questions, OER testing protocols, and work with the consultant on dissemination plans.

- - - Hebah Emara is the Librarian for Open Innovation at New York University, where she builds programs that focus on open data practices, redress of algorithmic bias, responsible data governance, and more. She previously worked as the Emerging Technologies Librarian at Teaneck Public Library (NJ). An OCLC/LITA Spectrum Scholar, Emara is interested in promoting emerging technologies, and community empowerment in library services.
    - Scarlet Galvan is the Collection Strategist Librarian at Grand Valley State University Libraries, where she leads efforts toward more equitable, sustainable collections. As a member of SPARC's Executive Steering Committee and a previous editor for Weave: Journal of Library User Experience, Galvan's research focuses on the socio-political aspects of library services platforms.
  - Community Outreach Leads will work closely with Primary Investigators to ensure that outputs center community needs. Their work will include outreach to community centers, focus group moderation, and assessment of prototypes and dissemination plans.
    - Andrea Puglisi is the Digital Initiatives/Technology Librarian at Westfield State University, where she administers the library's systems, including a digital repository, and an on-call Reference Librarian at Springfield City Library in Massachusetts. An Executive Board Member of Massachusetts Library Association, Andrea's career in public and academic libraries has focused on the relationship between people and their use of technologies. Puglisi's research interests are at the intersections between digital privacy and the impact of monetized digital information systems on learning, trauma and polarization.
    - Public Library Partner, *to be determined*.
      - While several of our team members and our advisory council have extensive experience working in public libraries, we recognize the importance of having at least one team member currently based in a public library. Thus, we are working to identify a potential public library partner, possibly Durham County Public Library (NC) or Route 9 Library & Innovation Center (DE). We will prioritize identifying a partner that serves racially and ethnically diverse communities and actively supports privacy and critical digital literacy programs.
  - Instructional Design Consultant will consult in the creation of OER prototypes, dissemination plans, and other outputs based on instructional goals, accessibility, and material sustainability. Consultation will occur during the second phase of the project for four months (approximately from April to August 2024).

- ■ Ashley Shea is the Head of Instruction Initiatives at Cornell University, where she leads Mann Library's critical information literacy program. Also a PhD student and researcher in Cornell's Department of Communication, Media & Technology, Shea's research centers on global open knowledge networks, and information discovery on social media.

Team members will focus on their lead areas, but the entire team will share and review all work. The project team will meet every other week with alternating meetings for the steering team at Cornell and the team-at-large.

Advisory Council

The Advisory Council will receive quarterly reports (six in total over 1.5 years) on grant progress updates, and have additional opportunities to share feedback in writing. Additionally, they will participate in two meetings per year (three total during the grant period) to check in with the project team and provide input on project progress.

- ● Bonna Boettcher is the Associate University Librarian of Public Services at Cornell University. Her research interests include digital humanities, library administration, and fictional representations of music and musicians.
- ● Alison Macrina is the Founder and Director of the Library Freedom Project. An activist, contributor to the Tor Project, and author of *Anonymity*, Macrina and her work have been recognized by the American Civil Liberties Union, American Library Association, Electronic Frontier Foundation, and many others.
- ● Matthew Bui is an Assistant Professor of Information at the University of Michigan School of Information and has faculty affiliations with the NYU Center for Critical Race and Digital Studies and UCLA Center for Critical Internet Inquiry. His research focuses on critical data studies, particularly explorations of racial justice in data-driven technology. Bui's work has been recognized and supported by the Annenberg Foundation, Democracy Fund, the Research Conference on Communications, Information and Internet Policy, and many others.

Work Plan Overview/Structure and Phasing

This project will take place over 18 months and will be split into two phases. Phase One will focus on assessing the current needs and understandings related to algorithmic literacy, big data, and surveillance. The outputs of Phase One will include a literature review and assessment report detailing findings from a survey of LIS professionals and patron community focus groups. Phase One will begin August 2023 and conclude April 2024. Phase Two will focus on using findings from our research, doing outreach to create OER prototypes and dissemination plans, and evaluating our outputs to create next steps beyond the grant project. Phase Two will begin in May 2024 and conclude January 2025. Please see the accompanying Schedule of Completion for more details on the project timeline. Please also see the Digital Products Plan for more information on how we will manage our research data and digital products.

Work Plan Assessment

Assessment of our performance will be embedded throughout the grant period, with opportunities for informal assessment and structured feedback and evaluation. Each quarter, Project co-PIs will submit a progress report to the advisory board indicating progress on deliverables. These reports will include

updates on two core components of our project: community engagement and educational outputs. While the project team plans to record expectations from our target communities (LIS professionals and patron communities) during the grant period, we will also prioritize the following considerations in evaluating the eventual OER outputs:

- **Clarity:** How well does this lesson explain key concepts in algorithmic literacy without relying on technical knowledge and jargon?
- **Commitment to equity, inclusion and justice**: How does this lesson center the voices of communities most impacted by algorithmic bias?
- **Pragmatism:** What practical knowledge on algorithmic literacy does this lesson provide?

These considerations will be embedded into our research study designs in both Phase One and Phase Two. Please see the Performance Measurement Plan for more details on project evaluation.

Outputs
1. **Literature Review**
   a. The literature review will focus on scholarship in LIS and related fields including computer science, technology studies, sociology, education, and legal studies. We will examine: What opportunities for algorithmic literacy education are specified in the literature? What important work is developing among community-based algorithmic accountability advocacy groups? The literature review will help solidify what needs have been specified in academic and community-based organizations broadly. The literature review will be incorporated in the full assessment report.
2. **Assessment Report: Current Needs in Algorithmic Literacy**
   a. Study design and IRB
      i. Informed by the literature review findings, we will design a survey and semi-structured focus group interview scripts for a two-part study: a survey of LIS professionals and focus groups of academic and public library patron communities. Before conducting the survey and focus groups, we will submit our study to the IRB for approval.
   b. Survey of LIS professionals
      i. The survey of library and information science professionals will be built on a secure survey platform (e.g., Qualtrics) and distributed broadly among professional listservs. Our survey will aim to explore: How do library and information professionals define needs in algorithmic literacy for their own patron communities? What pedagogical techniques are currently being employed in these settings? While our project team is primarily composed of professionals with experiences in academic and public library settings, we will solicit input from professionals based in any library context.
   c. Focus group conversations among academic library and public library patron communities
      i. Each of our team members will host one focus group at our institution or community of work. As part of focus group recruitment, each team member will identify at least one community organization (e.g., community centers, student groups, continuing education programs) to partner with in hosting and recruiting focus group participants over the age of 18. We will aim for at least 5-8

participants per group. Focus groups will include a moderator and observer from the project team. We will provide funding for meals during these sessions. We will prioritize recruiting students, community members and organizations engaged in issues regarding discrimination and harm in technology. Our questions will explore: What do patrons know about algorithms, big data, and privacy? What concerns, questions, and feelings do they have about data collection and access to information? How do patron communities in academic and public library settings describe issues on algorithms in their lives, if at all? What do patrons wish they could learn more about? What formats (worksheets, games, lectures, etc.) for instructional materials do they find best for personal learning? Where do they look for learning materials?

 d. Synthesizing findings from survey and focus groups

  i. Using the survey responses and focus group analyses, we will draft a report on our findings and propose outlines for OER materials to meet LIS educator and patron needs. The report will be shared with the Advisory Council and community participants for feedback. After addressing feedback and making the appropriate changes, the complete report will be available online under a Creative Commons license. Additionally, findings from this report will be used in conference presentations for library audiences.

3. **OER prototypes**

 a. We will create three kinds of OER prototypes based on the needs identified in our report. Prototypes will have applications for patrons and library staff.

  i. The first subset will be learning materials that can be immediately used in educational settings or by patrons. Depending on the focus group feedback, materials may include worksheets, asynchronous interactive tutorials, lesson plans with openly licensed online learning objectives, and games. Moreover, we want to ensure that we have materials that can be assigned for homework or completed solo, materials to be used in a classroom or workshop setting, and finally, interactive materials that will gamify educational content to make it more accessible for a variety of learners. Materials will be developed with universal design and critical pedagogical practice in mind.

  ii. The second will be a training toolkit for staff to help library workers incorporate algorithmic literacy, or the critical evaluation of computational ordering processes, into their information literacy programs. While materials will be applicable for off-the-shelf usage, they also will be given Creative Commons licensing (likely CC BY-NC-SA 4.0). Included in the toolkit will be information about how to use, remix, modify, or create additional educational materials.

  iii. The third subset of materials will be assessment tools. Developed in consultation with the users of different library types represented in the project team (R1 private university, land-grant institutions, public university, public library), this toolkit may include peer and self-assessment tools, classroom polls, post-instructional surveys, grading rubrics, quizzes and team-building activities. These materials will correspond with the curricular materials and training materials so they can be used in tandem.

4. **Work Plans for OER dissemination**
    a. We will disseminate the report and OER prototypes along with a call for feedback to both LIS professionals and patron communities. How we disseminate these materials, both the prototype and the report, is crucial for this project. As great as our resources may be, they need to be made easily discoverable, accessible, and adoptable, so that they will be used long beyond this grant timeline. As such, we will take a two-pronged approach to disseminate the OER prototypes:
        i. <u>LIS professionals:</u> The first prong is focusing on professional outlets for material dissemination. This includes a partnership with the Library Freedom Project for the dissemination of these OER materials. We will also share materials through professional listservs with our colleagues (both library workers and faculty), and present on the report and prototypes at professional conferences and organizations. The project team members will perform training at their institutions, as well as at national (such as Digital Library Forum) conferences and regional or state library associations meetings through workshops, webinars, and other presentations. Team members will also incorporate the OER materials into their institution curricula and educational repositories. Materials will also be uploaded to popular repositories, like OER Commons and MERLOT.
        ii. <u>Patron communities</u>: As much as possible, we will keep in touch with communities that participated in the focus groups and host follow-up programs demonstrating OER lessons in action. This will include training sessions, workshops that highlight the educational materials, and drop-in hours for troubleshooting. In addition to providing hands-on help with the OER, this kind of programming will allow us to receive structured and in-depth feedback about prototypes. We will also host semi-structured conversations for feedback. We will provide meals and refreshments for participants' time and insights.
    b. In the final stage of the project, we will incorporate feedback from LIS professionals and patron communities into the OER. In the future, our team aims to pursue additional funding for expanding implementation of the OER to support translation services for materials, creating additional materials, and adoption grants.

Diversity plan

Algorithms encode social biases, as is well known from congressional hearings, lived experiences, and academic research. Scholarship inspiring this project comes from women of color researchers, such as Ruha Benjamin, Simone Browne, Joy Buolamwini, Safiya Noble, and Zeynep Tufekci, who have examined how algorithms affect marginalized communities. Principal non-sponsoring investigators of this project are librarians of Latine(x/a/o) and South Asian heritage. Their work has shown that improving the understanding of algorithms and how they affect information access and lived experiences, can help limit the reach of algorithms and empower our communities. Algorithms are an equity issue, as they harm marginalized communities at a disproportionate rate, and thus algorithmic literacy is needed to address this issue.

To teach algorithmic literacy effectively and sustainably, materials need to be accessible. Current available resources about the harms of algorithms are either paywalled by academic research platforms, or created for specialized use-cases or educational programs. The aim of this project is to build on these

available resources to make them approachable and applicable in a variety of institutions and to a wide variety of audiences.

The project's outreach and assessment components are likewise rooted in community engagement and employ community-driven decision-making. Our project team includes team members from research universities and non-research universities, public and private institutions, and academic and non-academic institutions. By using feedback from non-library affiliated community groups, we can build materials that are accessible both in library and non-library contexts. Critical pedagogy and universal design principles will guide the OER development. We will give materials Creative Commons share-alike-noncommercial licenses to allow others to adapt materials for their institutions. All materials will undergo accessibility checks to ensure they meet WCAG 3.0 (or current WCAG) standards.

We also recognize the need for materials to be discoverable so that they can be used. To this end, focus group participants and survey respondents will be asked questions about where they find information. The literature review will include reviewing best practices for OER discoverability. An OER expert will consult on improving discoverability of materials so that they are sustainable and usable by the target audiences. Opportunities for feedback from community partners and participating institutions will be available throughout the grant period.

The report and OER materials (as well as calls for survey participation) will be distributed via professional organizations including ALA Ethnic Caucuses, We Here, and Library Freedom Project. We plan to present our findings and materials at national conferences such as the Digital Library Federation Forum and the Allied Media Conference. Our partnership with Library Freedom Project (and strong representation of LFP members on our project) will ensure that these materials are readily available to library workers interested in protecting patron privacy and teaching about algorithms and related topics such as big data, vendor surveillance, and critical information literacy. Training toolkits allow content to be easily adopted and adapted in a variety of institutions including K-12, rural libraries, and community colleges.

Schedule of Completion

Activity	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1
Phase 1: Assessing current needs																		
• Review LIS scholarship and perform environmental scan on key community-based organizations working in algorithmic literacy	█	█	█	█	█													
• Write literature review	█	█	█	█	█													
• Design survey for LIS professionals and community focus group scripts		█	█															
• Submit materials to IRB for review		█	█															
• Identify and reach out to potential community partners		█	█															
• Conduct survey for LIS professionals			█	█														
• Conduct community focus groups				█	█													
• Analyze survey and focus group data				█	█													
• Synthesize findings from survey and focus groups				█	█	█												
• Integrate literature review and study findings into one report							█	█	█									
• Share final report with stakeholders									█									
Phase 2: Developing OER prototypes for review and feedback																		
• Develop three lesson module prototypes for LIS practitioners										█	█	█						
• Create work plans for OER dissemination												█	█					
• Share lesson module prototypes with stakeholders for feedback														█	█			
• Present preliminary findings at professional conferences															█	█		
• Incorporate feedback from public presentations into OER planning															█	█		
• Deposit OER into online repositories																	█	█
• Strategize on expanding access to OER in a future implementation grant																	█	█

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Open Educational Resources on Algorithmic Literacy: Digital Products Plan

The project team will return to this digital products and data management plan in preparation for every quarterly advisor report to ensure that these digital products and research data are being properly stewarded throughout the grant period.

This project will produce the following digital products:
- Literature review and assessment report on current needs in algorithmic literacy
- Three OER prototypes for "algorithmic literacy packages" containing off-the-shelf curricula, online learning objects, and assessment tools

Additionally, this project will produce the following research data:
- Qualitative data collected via surveys of LIS professionals
- Qualitative data collected via semi structured focus groups of patron community partners

All working files will be managed in two cloud storage locations: Google Drive and Box. Google Drive will store the project team's nonsensitive working documents, including drafts of reports, timelines and research study planning materials. Box will house the project's more sensitive working files, including research study materials such as survey results and transcripts of focus groups and user studies.

The **literature review and assessment report** will be stored in PDF format in the Cornell University digital repository, eCommons (https://ecommons.cornell.edu). eCommons provides stable, long-term public access to digital content produced by members of the Cornell University community. As per our institutional repository requirements, this report will be openly available and adhere to current World Wide Web Consortium (W3C) standards. To enhance findability, links to this report will be accessible in all spaces that our OER are posted. The study's survey questions and semi-structured focus group conversation templates will be included as appendices in this report.

The three sets of **OER prototypes** produced from this project will include images and documents files. When being prepared for sharing, we will prioritize storing the digital files in lossless formats, including PNG, DOC, and PDF. All materials will undergo accessibility checks to ensure they meet WCAG 3.0 (or current WCAG) standards.

Materials will also be uploaded to OER Commons and MERLOT. Digital materials will be given Creative Commons licensing (likely CC BY-NC-SA 4.0) to allow use, sharing and adaptation of the educational materials with attribution. After the grant period, the project co-PIs are committed to annually reviewing whether the materials should be migrated to different repositories. Long-term preservation planning will also be embedded into future implementation grant planning.

Research data
There will be two phases of collecting qualitative data via surveys of LIS professionals. In Phase One, we will conduct a survey of LIS professionals to better understand how library and information professionals

define needs in algorithmic literacy for their own patron communities, as well as what pedagogical techniques are currently being employed in these settings. Data collection for the initial survey will take place from October to November 2023. Our survey will aim to explore: How do library and information professionals define needs in algorithmic literacy for their own patron communities? What pedagogical techniques are currently being employed in these settings? In Phase Two, we will gather qualitative feedback on our OER via a secure survey of LIS professionals once again, from September 2024 to October 2024. While our project team is primarily composed of professionals with experiences in academic and public library settings, we will solicit input from professionals based in any library context for both surveys. The data from both surveys will remain anonymous, as we will not collect personal identifying information.

In Phase One of the project plan, we will conduct semi-structured focus groups of library patrons, collecting qualitative data on patrons' experiences and interests in algorithmic literacy topics. Data collection will occur November to December 2023. In Phase Two, we will host follow-up programs and user studies demonstrating OER lessons in action. We will also host semi-structured conversations for feedback. Data collection will take place from September to October 2024. We will record all conversations using Zoom, a secure platform that supports audio and automatic transcription. Team members will review focus group conversation audio to ensure that transcription is accurate before analysis. We will use NVivo to facilitate analysis of our focus group and user studies data.

Since this study incorporates human subject research, we have incorporated IRB review into our research study planning. We will secure IRB approval before moving forward with any of our human subjects research. As part of our study, we will collect consent agreements for focus group participants in PDF format. These records will be retained in our shared Box cloud storage space until one year after the conclusion of the grant (January 2026) and subsequently destroyed. During the course of research data collection, the project will use Cornell's enterprise version of Box.com, a cloud-based password-protected data storage and collaboration platform. Box maintains data in an encrypted format, both during transmission and at rest, and it offers detailed versioning and auditing of who has edited or viewed stored files. Box offers customizable read/write permissions, allowing only authorized individuals access to the data.

All data collected during focus group and user studies will be de-identified. Individual identifiers will be removed from final needs assessment reporting, anonymizing all participants. During the research process, focus group locations and participants will not be specified. Whenever possible, geographic and identifying information will be removed from the transcripts to protect the confidentiality of focus group and user study participants.

To protect the confidentiality of all research participants, the research data from this study will not be released publicly. All study results and accompanying files will be managed securely within the project team's shared Box space. The audio files produced during focus group conversations will not be preserved for public access and will be destroyed at the conclusion of the study. Due to the potentially sensitive nature of the focus group conversations, the transcription files will also be destroyed at the completion of this study.

Based in Ithaca, NY, Cornell University's founding principle was stated by founder Ezra Cornell in 1868: "I would found an institution where any person can find instruction in any study."

University Mission Statement:
>Cornell is a private, Ivy League university and the land-grant university for New York state. Cornell's mission is to discover, preserve and disseminate knowledge, to educate the next generation of global citizens, and to promote a culture of broad inquiry throughout and beyond the Cornell community. Cornell also aims, through public service, to enhance the lives and livelihoods of students, the people of New York and others around the world.[1]

Led by Elaine L. Westbrooks, the Carl A. Kroch University Librarian, the Library reports to the University's Provost. Cornell University Library is a highly valued partner in teaching, research, and learning at the university. With an operating budget of approximately $65 million and a staff of more than 350 Full-time Employees, the Library supports 2,700 faculty, 22,000 students and 94 PhD fields. Its world-class collections, expert librarians, and responsive services in both physical and virtual spaces inspire and nourish scholarship and learning.

Cornell University Library Mission:
>Cornell University Library promotes a culture of broad inquiry and supports the University's mission to discover, preserve, and disseminate knowledge and creative expression. It engages with the ongoing transformations of society to deliver world-class physical and digital content and services critical to research, education, and outreach, now and in the future. The Library acts globally, supporting Cornell's land grant mission in New York State and beyond, and builds partnerships within and outside the university. It invests in its staff, collections, and physical and virtual libraries.[2]

The Research & Learning Services (RLS) unit is based in Olin & Uris Libraries, the largest libraries in Cornell University Library's system with the broadest user community. RLS is the instruction and reference arm of the humanities and social science library. Library workers in this unit provide reference help, research support, teach information literacy, and support collection development.

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[1] Cornell University Mission. https://www.cornell.edu/about/mission.cfm, accessed March 15, 2023. The University is led by a Board of Trustees

[2] Cornell University Library Mission. https://www.library.cornell.edu/about/, Accessed March 15, 2023