Laura Bush 21st Century Librarian (LB21) National Forum Grant preliminary proposal narrative – UMD iSchool

Piloting an Online National Collaborative Network for Integrating Computational Thinking into Library and Archival Education and Practice

The University of Maryland iSchool seeks a $249.9K 2-year Laura Bush 21st Century Librarian (LB21) National Digital Infrastructures and Initiatives (NDII) Project Grant to pilot an online national collaborative network of educators and practitioners to enable the sharing and dissemination of computational case studies and lesson plans through an open source cloud-based platform based on Jupyter Notebooks. "Jupyter is a free, open-source, interactive web tool known as a computational notebook, which researchers can use to combine software code, computational output, explanatory text and multimedia resources in a single document." (Int Journal of Science, 2018). The goal is to change the current MLIS-level educational culture and build a community network that supports educators and practitioners in training the next generation of library and archives leaders.

1. Statement of Broad Need

"The use of emergent technologies have profoundly altered the nature of archives, by disrupting how information is created, recorded, captured, encoded, curated, shared, made available and used" (E. Goudarouli, 2019). These changes are affecting libraries and archives of all sizes. This is apparent in the decision of the National Archives and Records Administration (NARA) to stop accepting paper-based records at the end of 2022 (Fedscoop, 2019). Similarly, at the Library of Congress digital strategies are being piloted based on how "people are using computers to do computational analysis". LOC wants to enable computational research by making sure their collections are available in machine-readable ways, increasingly providing access to materials through APIs and other bulk data interfaces (GovLoop, 2019). In the IMLS "Collections as Data" project *(LG-73-16-0096-16),* examples of computational treatments of collections are illustrated where "a Digital Humanities researcher engages in term frequency visualization, topic modeling, and network analysis across thousands and sometimes even millions of items." Beyond text data "the scope of data extends to images, moving images, sound, web archives, and beyond."

IMLS recently funded two Computational Thinking (CT) grants to facilitate the development of critical literacies applicable to STEM learning *(LG-14-19-0079-19 U. Maryland w. PI Subramaniam and RE-12-19-0094-19 CUNY w. PI Sanchez)*. CT is described as a form of problem solving that uses, modeling, decomposition, pattern recognition, abstraction, algorithm design, and scale (Wing, 2006). **The argument for integrating CT into library and archival science parallels the case for its inclusion in mathematics and science classrooms.** It is motivated by this emerging digital and computational landscape of library and archival work. For today's learners to succeed in future library and archival tasks, it is essential that CT be included as part of their training (W. Underwood 2018).

During FY 2019 through a $99.2K Laura Bush 21st Century National Digital Platform Symposium grant entitled *Developing a Computational Framework for Library and Archival Education*, we conducted research with the explicit goal of exploring how CT practices might be incorporated into Masters-level curricula in Library and Archival Science. The results of that project were:

(1) **A demonstration that the twenty-two CT practices** that have been identified as important in STEM education also occurred and were essential for performing archival practices when addressing digital records.
(2) **Jupyter Notebooks** were a useful tool for recording and organizing the tasks, data, tools and results of performing archival tasks on digital records.
(3) **An on-line repository called CASES** (Computational Archival Science Educational System) was constructed for storing and providing access to Jupyter notebooks that recorded the results of performing archival tasks on digital records.
(4) **A method was developed** for converting computational archival research cases in Jupyter notebooks to computationally enhanced lesson plans, also in Jupyter notebooks, that included a teacher's guide to computational tools, links to computational tools, examples of archival tasks that exhibited CT, and exercises that required the use of CT skills.
(5) **A taxonomy of archival topics**, practices and learning outcomes was derived from Library and Archival Studies and Digital Curation courses taught in the MLIS program of the University of Maryland. This taxonomy is to be used in indexing the cases and computationally enhanced lesson plans in the CASES repository to support search and access to lesson plans relevant to Archival courses. A decision to augment the taxonomy with ethics attributes was reached.
(6) **A two-day symposium** was conducted at the Univ. of Maryland in April 2019 in conjunction with the 2019 iConference in which the results of this research was presented to some 50 national and international experts in "Collections as Data".

The idea for an online national collaborative network pilot proposal originated from feedback provided by educators and practitioners from this Workshop and over the summer at Best Practices Exchange 2019, the AERI2019 Conference in the UK, and the Archival Educators Section at the 2019 Society of American Archivists (SAA) annual conference, in particular.

2. Project Design

The objective of the proposed project is to pilot a national collaborative network of educators from iSchools and Professional Programs and practitioners from Libraries, Archives, and Cultural Organizations. Educators are rapidly adopting Jupyter Notebooks for teaching, use in the classroom, developing teaching materials, and creating computational stories. These are inspired by the 18th and 19th century paper-based lab notebooks that were used in science research and that captured observations, experiments, ideas, notes, formulas, and data.

Collaborative network participants (CNP) include 4 educators from iSchools (Drexel U., UCLA, Kent State U., and the U. of Missouri – with professors at all ranks) who will each be paired with one of 4 practitioners (Swarthmore Lib., Densho.org, Harvard U. Lib, and Smithsonian Institution Archives). Results will be piloted in the U. Maryland MLIS program and in the Clayton State professional Master of Archival Studies program, and next at each of the 4 iSchools. In addition, **core team members (CTM)** include experts in project management, lesson plan evaluation, digital archives, and visual representation ethics and community values. Feedback on the pilot will be sought from **international computational library and archives collaborators** from the UK, Canada, Brazil, Australia, Kenya, India, and Japan, most of whom attended our Symposium workshop in April 2019 and have strong interest in this innovative CT approach. Our plan is to:

(1) **Introduce** Academic-Practitioner teams to CT and Jupyter Notebooks.
(2) **Pair up** academic faculty work with practitioners on an archival task involving digital materials, use computational tools applied to the materials, and record the data and results in a Jupyter notebook producing a computational archival research case.
(3) **Develop** lesson plans from Archival research cases uploaded to the CASES repository that exhibit CT, introduce teachers to the computational practices and tools, and enhance the lesson plans with exercises for developing CT skills and utilizing computational tools in managing and archiving digital records.
(4) **Enhance** the CASES repository to include lesson plans as well as cases, and index it using the taxonomy developed in the prior project.
(5) **Develop** a lesson plan for an introductory course in Python Programming for MLIS students that introduces some of the CT practices.
(6) Have **academic partners** use lesson plans that are developed by others in the network to enhance CT in library and archival science courses taught in their programs.
(7) Have an **educational specialist** work with the instructors to evaluate the impact of these supplemental computational enhanced lesson plans on their library and archival science courses.
(8) Work with a **visual representation expert** to reveal and address issues of ethics and community values for each case.
(9) **Disseminate** the results through conference papers and continuing education workshops.

3. Diversity Plan

Dr. Lyneise Williams, associate professor in Art History at UNC Chapel Hill, through her newly founded VERA Collaborative (Visual Electronic Representations in the Archive) will embed herself in this online collaborative network. VERA addresses the distortions and erasures in visual representations, linked to reproduction technology, that particularly impacts communities of color and other under-represented communities. Dr. Williams in conjunction with the iSchool Diversity Officers, will help recruit student participants, to ensure diversity and inclusivity in our project.

4. Broad Impact

This project will pilot an online collaborative network. It is expected that the approach will be unifying in nature: not only impacting the way MLIS Master's courses are taught, but being beneficial to other teaching levels (pre-professional, doctoral, early career development, and even continuing education). Our approach is based on a unifying framework that allows case studies and lesson plans to be shared, re-purposed, and searched based on a common reference set of practices in three areas: **archives**, **computational thinking**, and **ethics/values considerations**. International partners interested in the integration of CT into library and archival education and practice will benefit by validating the approach.

5. Budget

We request from IMLS a total budget of $249,999 over a two-year period (Sep. 1, 2020-Aug. 31, 2022). This includes $179,211 in direct costs and $70,788 in indirect costs calculated at UMD's negotiated rate of 39.5%. Direct costs include partial summer support for 2 senior personnel ($30,423), partial salary support for 1 research software integrator ($13,260), associated fringe benefits ($5,528), travel ($10,000), and partial support for up to 12 of the **CNP** and **CTM** members referenced at the start of section 2. Project Design ($120,000 total with $10,000 per person over two years).