View From Across the Pond:

Opportunities, Gaps, and Challenges in Digital Curation Lifelong Learning

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***Abstract*—While some excellent lifelong learning programs in digital curation and preservation for cultural heritage information professionals exist in the US, most activities are sporadic and depend on temporary and shrinking grant funding. How best to provide continuing education on digital curation and preservation remains an open question. This paper will critique current programs, discuss key issues, and question the sustainability of existing efforts.**

Keywords-component; digital curation; education; life-long education; digital preservation, continuing education

I. INTRODUCTION *(HEADING 1)*

Mechanisms are also needed to accelerate the transfer of new knowledge into practical working digital preservation systems to prevent further loss of valuable digital collections. There is a pressing requirement for education and training in new digital archiving methods, tools, and technologies [1].

The new discipline of digital preservation needs to be supported. This should include the provision of continual professional development for existing individuals with relevant skill sets, e.g., archivists, librarians and IT staff [2].

Curation of digital assets, whether cultural, educational, scientific, or economic, remains one of the central challenges of our time [1, 3-16] While the last 20 years have witnessed extensive progress toward robust repository architectures, the development of numerous preservation tools and strategies, and standards for everything from metadata to trustworthy digital repositories, most repositories are no closer to sustainable, long-term preservation than they were when Margaret Hedstrom wrote that digital preservation was a "time bomb for digital libraries" in 1998 [16]. Grant-funded projects have provided a firm foundation for ongoing research and development but ten years after the "It's About Time" report [1], and seven years after "Mind the Gap," [2] the need for the dissemination of best practices, standards information, and especially training and support of digital preservation and curation professionals is more pressing than ever. Not only is the volume of digital data and heritage materials growing at an alarming rate but the expanding professional and research literatures often serve to confuse rather than clarify. The novice digital curator has much to learn and an increasingly complex pathway to learn it on his or her own.

Many information practitioners, regardless of their job titles, are conducting digital curation activities in a wide range of repositories and institutions today. Often these are new tasks and processes for which most current staff members have little training or experience, especially in small- to medium-sized cultural heritage institutions. Life-long education for scientific data curation is another area of pressing need. In light of mandates from funders such as the National Science Foundation (NSF) for data management plans (DMP), a growing number of institutional repository staff in academic libraries faces the challenges of advising researchers regarding data curation best practices and managing and preserving the data themselves. Few librarians or archivists in these settings currently have training in or experience with curating data and struggle to keep up with the literature.

In 2009, the Digital Curation Centre (DCC) and the Research Information Network (RIN) conducted a study to determine the roles and responsibilities needed for successful data management as well as the needed expertise of "data specialists" and pointed out the need for data curation education and training [17]. A limited number of graduate Information and Library Science (LIS) programs in the United States, most supported with Institute of Museum and Library Services (IMLS) funds, are now providing some sort of graduate instruction in digital or data curation (e.g., Simmons University, Syracuse University, the University of Arizona, the University of Illinois – Urbana-Champaign, the University of Maine, the University of Michigan, the University of North Carolina-Chapel Hill, and the University of North Texas), but continuing or life-long education for existing information professional is witnessing far less activity, little systemization of efforts, and few programs that are likely to be sustainable. There remains a strong need for more extensive, programmatic, and sustainable professional education for practicing librarians and archivists for digital preservation and curation.

II. .EXISTING CONTINUING EDUCATION PROGRAMS IN DIGITAL AND DATA CURATION IN THE UNITED STATES

Numerous small-scale and one-off education events focused on digital and data curation take place through webinars and face-to-face around the United States. Many of these events, much like the one you are attending today, are

designed to raise awareness around digital and data curation in general or for specific curation issues and are one-time deliverables from grant-funded projects. Few are developed over time into rigorous programs. It is hard to know the effectiveness of such events in the overall scheme of professional education and it is highly unlikely that most participants can piece these training courses into any sort of systematic or strategic whole. These stand-alone, one-hour to two-day events are unlikely to provide comprehensive or in-depth understanding of key curation activities, skills, or resources.

A few continuing education programs in digital preservation and curation stand out in the United States. I will highlight these programs before talking about the systematic challenges life-long education poses.

A. Digital Preservation Management Workshop (DMP)

One of the longest running programs is the Digital Preservation Management workshop [18]. This week-long workshop series started at Cornell University in 2003 under the direction of Anne Kenney and Nancy McGovern, moved to the Interuniversity Consortium for Political and Social Research at the University of Michigan during 2008-2012, and is now housed at MIT where Nancy McGovern is head for Curation and Preservation Services for MIT Libraries. These workshops incorporate "community standards and exemplars of good practice to provide practical guidance for developing effective digital preservation programs" and features lectures, exercises, and an online tutorial [19]. NEH partially funded the DPM workshops over the years but they are now self-sustaining. The DPM Workshop has travelled to several countries and serves as the basis for University of London Computer Centre's Digital Preservation Training Programme (DPTP) [20].

The primary goal of the DPM workshops is to "promote practical and responsible stewardship of digital assets" [19]. More specifically,

> The goals of the workshop are to foster critical thinking in a technological realm and provide the means for exercising practical and responsible stewardship of digital assets in an age of technological uncertainty. The workshop sessions are geared towards making a digital preservation program doable for any organization and all of the sessions include as many relevant examples as we can fit. [19]

The target audience for this series is managers who are or will be responsible for digital preservation programs in libraries, archives, and other cultural institutions. The workshops provide a management perspective, much the same as the Managers' Lens does in the DigCurV Framework [21].

Key components of the program include 1) the three-legged stool model that articulates organizational infrastructure, technological infrastructure, and requisite resources necessary for successful digital preservation; 2) action plans to take away from the workshop for developing policies and practice at home institutions; 3) sessions focused on technology trends and best practices in the digital preservation community; 4) a virtual field trip; and 5) readiness assessments and discussion of the five stages of institutional readiness for digital preservation programs [19]. The DPM workshop has contributed to several other digital preservation programs including DigCCurr [22], the e-science Institute [23], DPOE [24], and SAA's DAS program [25] in the United States and the Digital Preservation Training Progamme (DPTP) [20], Assessing Institutional Digital Assets (AIDA) [26], and the Collaborative Assessment of Research Data Infrastructure or (CARDIO) [27] in the United Kingdom.

B. Library of Congress' Digital Preservation Outreach and Education (DPOE) Program.

In September 2011, Library of Congress' (LOC) launched the first Digital Preservation Outreach and Education Program (DPOE) in Washington, DC [24]. Twenty-four trainers were drawn from across America to be trained in the fundamentals of digital preservation. LOC expanded the network to 45 trainers during the next year and the program continues to grow. DPOE has a mission to: "foster national outreach and education about digital preservation by building a collaborative network of instructors and partners to provide training to individuals and organizations seeking to preserve their digital content" [24]. The DPOE curriculum is built around six verbs and questions:

Identify - what digital content do you have?

Select - what portion of that content will be preserved?

Store - what issues are there for long term storage?

Protect - what steps are needed to protect your digital content?

Manage - what provisions are needed for long-term management?

Provide - what considerations are there for long-term access? [28]

DPOE is targeted at each layer of the information professional workforce as captured in this diagram [29]:

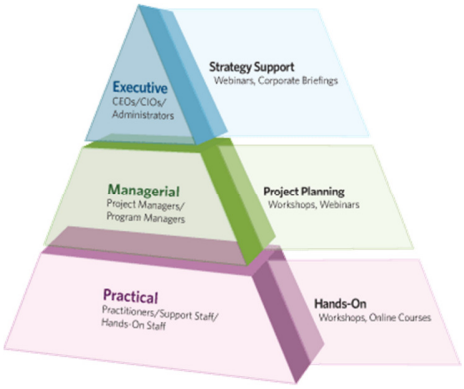

Figure. 1. DPOE Pyramid

DPOE divided the organizational pyramid so that outreach could be tailored to all levels of the workforce.

C. DigCCurr I & II

Preserving Access to Our Digital Future: Building an International Digital Curation Curriculum, (DigCCurr I; IMLS Grant # RE-05-06-0044) [22] was a collaboration of the School of Information & Library Science (SILS) at the University of North Carolina at Chapel Hill (UNC-CH) [30], and the U.S. National Archives & Records Administration (NARA) [31]. It ran from July 1, 2006 – December 31, 2009.

The overall goal of DigCCurr I was to prepare graduate students for digital curation positions with a wide variety of organizations, contexts and types of resources. This project had three main thrusts:

1. creation of a curriculum that involved a master's-level curricular framework, course modules, course development, experiential components, and international guest speakers;
2. two International Symposia - DigigCCurr2007: April 18-20, 2007 [32] and DigCCurr2009: Practice, Promise and Prospects: April 1-3, 2009 [33]; and
3. the Carolina Digital Curation Fellowship program that funded five master's students for two years.

A key product from DigCCurr I is the DigCCurr Matrix of Digital Curation Knowledge & Competencies [34]. This is a tool for thinking about, planning for, identifying and organizing material to cover in a digital curation curriculum. Each unit of curriculum content can address one or more dimensions of the matrix. Articulating necessary skills and knowledge, the Matrix provides a framework to specify foundational and elective course content and customize course development for any educational setting or target audience.

The six dimensions of the Matrix are:

1. Mandates, values & principles.
2. Professional, disciplinary or institutional/ organizational context.
3. Transition point in information continuum/lifecycle.
4. Type of resource.
5. Function or skill.
6. Prerequisite knowledge.

Although designed for graduate-level curricular and course design, the Matrix is also useful in creating professional education workshops and life-long learning programs.

The IMLS-funded DigCCurr II, "Extending an International Digital Curation Curriculum to Doctoral Students and Practitioners," [35] was a collaboration of the School of Information and Library Science (SILS) at the University of North Carolina at Chapel Hill (UNC-CH) [30], the U.S. National Archives and Records Administration (NARA) [31], and the i-School at the University of Toronto [36]. It ran from August 1, 2008 through March 31, 2013.

Key DigCCurr II activities include:

- 6 PhD Fellowships
- Development of the Digital Curation Exchange (DCE) [37]
- The DigCCurr Profession Institute, 2009-2011
- Public Symposia, 2011-2013
- Ph.D. Seminar Series, 2012-2013

With initial funding from the Institute of Museum and Library Services (IMLS), UNC-Chapel Hill's School of Information and Library Science has offered the DigCCurr Professional Institute each May from 2009 to 2013. In June of 2012 the Danish Royal Library invited the DigCCurr Team to present the workshop to selected staff members. The Institute is comprised of week-long summer workshops for information practitioners with follow-up sessions held in early January [38]. The workshop is built off of the DigCCurr Matrix and is now self-sustaining.

D. The Society of American Archivists'(SAA) Digital Archives Specialist Certificate (DAS)

The Society of American Archivists' Digital Archives Specialist Curriculum and Certificate program [25] were conceptualized in 2011 while I was SAA President. Experts in the field of digital archives develop and refresh one-half to two-day courses on a continual basis and offer these in face-to-face workshops around the United States and via webinars.

DAS provides education and training to ensure that archivists adopt appropriate practices for appraising, capturing, preserving, and providing access to electronic records. It is also designed to provide archivists with the information and tools they need to manage the demands of born-digital records. Students can take individual courses or earn the Digital Archives Specialist Certificate after completing required coursework and passing both course and comprehensive examinations. [39]

Building from the DPOE Pyramid, DAS is structured in tiers of study for a range of archival audiences including administrators, managers, and practitioners. Descriptions for the tiers of study are found on the SAA website [40]:

- **Foundational Courses** focus on the essential skills that archivists need to manage digital archives. They focus primarily, but not exclusively, on the needs of practitioners—archivists who are or will be working directly with electronic records. These courses present information that an archivist might implement in the next year.
- **Tactical and Strategic Courses** focus on the skills that archivists need to make significant changes in their organizations so that they can develop a digital archive and work seriously on managing electronic records. They focus primarily, but not exclusively, on the needs of managers—those archivists who manage other professionals and who oversee programmatic operations.

These courses present information that an archivist might implement in the next five years.

- **Tools and Services Courses** focus on specific tools and services that archivists need to use for their work with digital archives. They are practical courses focused on specific software products and other tools and they focus primarily, but not exclusively, on the needs of practitioner archivists. These courses present information that an archivist could implement immediately.
- **Transformational Courses** focus on the skills that archivists need to change their working lives dramatically and transform their institutions into full-fledged digital archives. They focus primarily, but not exclusively, on the needs of administrators—those archivists with oversight over the entire archival enterprise of an institution. These courses present information that an archivist might implement over the course of the next ten years.

The DAS program is designed to address seven core competencies of Digital Archivist [39]:

1. Understand the nature of records in electronic form, including the functions of various storage media, the nature of system dependence, and the effect on integrity of records over time.
2. Communicate and define requirements, roles, and responsibilities related to digital archives to a variety of partners and audiences.
3. Formulate strategies and tactics for appraising, describing, managing, organizing, and preserving digital archives.
4. Integrate technologies, tools, software, and media within existing functions for appraising, capturing, preserving, and providing access to digital collections.
5. Plan for the integration of new tools or successive generations of emerging technologies, software, and media.
6. Curate, store, and retrieve original masters and access copies of digital archives.
7. Provide dependable organization and service to designated communities across networks.

III. Challenges for Professional Education in Digital Curation

There are many open questions for professional or vocational education in digital curation. These include:

- How long/extensive should training be?
- Where should training be held?
- How should training be supported/funded?
- How much should training cost?
- What types of credentialing are appropriate?
- Who should do the instruction?
- Should instruction be broad or specific?
- What should be the content?
- What prerequisite knowledge is necessary?

Currently, the landscape of professional education in digital curation involves a patchwork quilt of course offerings either in face-to-face or webinar modalities and that extend anywhere from one to two hours to week-long workshops. Several graduate schools of Information and Library Science are offering five to ten course post master's certificates and degrees [41-43]. Venues for these programs include colleges and universities wherein participants come to the teachers; "have workshop will travel" where the teacher comes to the pupil, often in conjunction with a conference; and one's computer (webinar). Workshops and courses may be part of a series held in one place or a series may be held in multiple places. Funding for professional education in digital curation includes grants, university continuing education programs, income streams for professional organizations, income streams for commercial firms, and non-profit groups that host events on a cost-recovery basis.

Whether aimed at administrators, managers, or practitioners, most of the existing programs are overviews and general in nature. Numerous gaps in this education landscape include:

- the need to integrate programs that address technical and professional knowledge and skills across the digital asset lifecycle;
- courses to support specialization in various curation functions.
- programs that address specific digital environments & resource types.

IV. Pedagogical Issues

What to Teach. Curriculum is just now being developed so there is no established canon at this time. Courses involve a blend of archival, information, business, and ethical principles along with cutting edge technical and process developments. Core content is, however, unclear as is the range of content and how instructional programs can best sequence course content for a variety of audiences and for participants who may not have taken courses in a strict sequence. Given the time and financial constraints of most workshop/course participants it is hard to fit in extensive core content to which all participants should be exposed as well as extended or specialized topics and maintain an audience. Overall there is uncertainty at all educational levels regarding what to teach to whom.

How to Teach. Given the expense of having working professionals travel to workshops, especially week-long courses, webinars have emerged as a significant training vehicle for digital preservation education in the United States. It is, however, unclear as to what is best taught in a face-to-face modality vs. by remote instruction. Regardless of venue, there are also questions concerning the best mix of lecture, discussion, and hands-on components in any instruction and especially how to provide practical experiences and exercises in remote instruction. There are also questions as to the proper role of field experiences/fellowships/internships/residency programs and how to integrate these components into larger instructional programs. Many of these internships programs

are currently funded through grant projects. It is unknown how these programs will continue without such funding sources.

Duration of Programs. In addition to how and what to teach, determining programmatic duration is a significant as well as practical challenge. Information professionals often have difficulty finding time for extensive continuing education yet there is much to learn; one should not expect to become a competent digital curator based on a few one-hour or even one-day workshops. How to get a core of information management and curation knowledge and skills to specialized audiences (such as administrators and funders) which have a limited attention span for learning about digital curation also needs to be addressed. Chucking of material and sequencing instructional modules in appropriate order seem key to success.

V. SUSTAINABILITY

Each of the programs presented above provide participants with high-quality training but sustainability of these efforts is uncertain. Questions abound.

- Who is going to pay for all this?
- What is the business model for continuing education in digital curation?
- Who is going to claim this instructional domain and at what levels?
- How is the academy going to be rewarded for working in this arena beyond formal graduate and undergraduate education?
- How can we reach such a large audience (everyone needs to know something about digital curation!)?
- Can I-Schools provide the digital curation teaching capacity that the government, military, corporate, scientific, academic, and public sectors will require?

The Digital Preservation Management workshop and the DigCCurr Professional Institute were both started with grant funding but now are largely run with the efforts and energy of a few people and registration fees. The Library of Congress' Digital Preservation Outreach and Education program has a small amount of LOC funding for the organizing office but instructors are unpaid. How long any of these programs can run on personal commitment is in question. The Society of American Archivist's Digital Archives Specialist program may represent a more viable and sustainable model. DAS is not only a commitment to the progress of the archival profession; it is also a funding stream for SAA. This ensures that SAA will be diligent in making DAS a robust and long-lived program.

VI. CONCLUSION

At this point continuing education in digital curation and preservation is exploratory and experimental – even the formal looking concentrations and certificates in universities are just underway. The canon for the field of digital curation is only just emerging. Research and development is rapid but not easily translated into workflows of existing professionals. Those taking on the challenges of providing professional or vocational education are working these issues out in real time but much remains speculative.

Digital curation educators need to work together, across national boundaries and across levels, scope, and instructional purpose. We need to share materials and discuss approaches and emerging good practice while ramping-up the educational workforce as well as educational efforts. We need to move from hand-crafted approaches to wide-spread and easily replicable solutions and be able to certify learning. Much work lies ahead.

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