

Digital Curation Preparation: A Survey of Contributors to International Professional, Educational, and Research Venues

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Abstract:

Titled “Digital Curation Preparation: Contributors to International Professional, Educational, and Research Venues,” this article jumps off the DigCCurr II project at the University of North Carolina at Chapel Hill, which focuses on doctoral-level education in digital curation education. The article centers on the contexts of digital curation research as framed by the educational, professional, and research interests of a diverse group of national and international stakeholders. Flexible, holistic, and inherently interdisciplinary, digital curation initiatives depend upon a lifecycle approach. Thus the administered survey culled information about respondents’ educational degrees and the academic disciplines in which they were earned, their employment options, job titles, professional association memberships, professional event attendance, and professional publications read. Finally, the paper discusses results, implications, and directions for future research.

1. Introduction

The term “digital curation” debuted only in 2001, but its intellectual roots reached back to the middle of the 1990s. (Higgins 2011). Digital curation soon engaged stakeholders from multiple communities; by 2007 digital curation professionals were the “newest type of information professional on the block” (Yakel 2007). Digital curation “involves the management of digital objects over their *entire lifecycle*, ranging from pre-creation activities wherein systems are designed, and file formats and other data creation standards are established, through ongoing capture of evolving contextual information for digital assets housed in archival repositories”(Lee and Tibbo 2007, emphasis in original). It is an “umbrella term for digital preservation, data curation, and digital asset and electronic records management” and brings together the scientific, educational, and professional communities with governmental and private organizations (Yakel 2007, p. 338-339). A lifecycle approach “ensures that all the required stages are identified and planned, and necessary actions implemented, in the correct sequence”; as a result, it “can ensure the maintenance of authenticity, reliability, integrity and usability of digital material” (Higgins 2008, p. 135). In short, digital curation ensures continuing access to and adds value to intellectual assets.

Interdisciplinary in scope, digital curation is supported by an active research network and generates a range of opportunities for presenting and publishing scholarship. An increasing number of information-oriented educational programs such as information science, archival administration, library science, and computer science provide both theoretical and practical training in the concepts and methods of digital curation. We have examined the educational and

professional backgrounds and characteristics of digital curation researchers and have explored their primary research interests.

2. Background

As late as 2007, Chris Rusbridge reported that digital curation was “regarded as that extra burden, the one just beyond what is currently possible” (Rusbridge 2007). In the same vein, Michael Lesk (2010) posed a fundamental question: “Data curation: just in time, or just in case?” It seems now evident that digital curation is and will remain a “mainstream” concern (Higgins 2011). It demands a flexible approach in designing educational and research frameworks (Fulton et al. 2011, Hank 2009, Lee 2009, Yakel et al. 2011). It engages a global and heterogeneous community of stakeholders. More importantly, digital curation educational programs have received considerable funding and professional attention in recent years. The Digital Curation Curriculum (DigCCurr I) project, for instance, developed a graduate-level curricular framework, course modules, and experiential facets (Lee, Tibbo, & Schaefer 2007a, Lee, C. A., Tibbo, H., & Schaefer, J. C. 2007b, Hank, C. 2010, Hank, C. & Tibbo, H.R. 2010, Gregory & Guss 2011). DigCCurr II: Extending an International Digital Curation Curriculum to Doctoral Students and Practitioners (2008-2012) includes the Carolina Digital Curation Doctoral Fellowship Program (CDCDF), digital curation curriculum development for PhD students, continuing education Professional Institutes, the Digital Curation Exchange (DCE), and Digital Curation Symposia. The DigCCurr Matrix of Digital Curation Knowledge and Skills can help educators and curriculum planners to determine what students need to learn to contribute to the field (Lee and Tibbo 2011).

DigCCurr is far from the only digital curation education initiative currently flourishing. Other recent initiatives include the Digital Curriculum Laboratory at Simmons College (Bastian, Cloonan & Harvey 2011); the University of Michigan’s Preservation of Information specialization (Yakel et al 2011) and Preservation and Access Virtual Education Lab (PAVEL) (<http://www.virtualarchiveslab.org/content/overview-background>); the University of Arizona’s certificate program in Digital Information Management (“DigIn”) (Fulton, Botticelli & Bradley 2011, Botticelli, Fulton, Pearce-Moses, Szuter & Watters 2011); the Data Curation Education Program (DCEP) at the University of Illinois Urbana-Champaign (<http://cirss.lis.illinois.edu/CollMeta/dcep.html>); and the proposed Graduate Academic Certificate in Digital Curation and Data Management at the University of North Texas. In addition, the Library of Congress has supported Digital Preservation Outreach & Education (DPOE) (<http://www.digitalpreservation.gov:8081/education/>); the European Commission’s Leonardo da Vinci program has supported Digital Curator Vocational Education Europe (DigCCurv) (<http://www.digcur-education.org/>); and the Joint Information Systems Committee and Research Information Network co-funded the Research Data Management Skills Support Initiative (DaMSSI), led by Digital Curation Center (<http://www.dcc.ac.uk/training/damssi>).

But challenges persist in digital curation education. It is “perhaps one of the hardest topics to teach precisely because ubiquitous computing dulls the sense of urgency and reinforces

a sense of complacency that only those deeply immersed in the technical challenges of digital curation understand to be a chimera”(Yakel et. al 2011, p. 23). More pragmatically, educators must decide what not to include in their curricula: as Botticelli and his colleagues stress, “teaching digital curation means engaging with an immature discipline characterized by fluid professional boundaries and uncertainty in the development of vital infrastructure”(p. 149). A digital curation curriculum “can never be considered finalized but must instead change in relationship to the world it serves”(Lee 2009). This paper characterizes existing digital curation education and research in a variety of contexts. We have undertaken this research in order to advance the efforts of the DigCCurr II project for doctoral-level preparation in digital curation. We hope that the findings will be helpful to others who are engaged in digital curation education and research.

3. Purpose of the study.

Two goals of the DigCCurr II project are to better understand and to cultivate doctoral-level education in digital curation. In order to advance both goals, we have attempted to characterize the types of research environments in which individuals engaged in digital curation research are embedded or have recently been educated. This paper reports data from an international survey of individuals who have presented their work in professional venues (conferences and journals) that address digital curation. It describes their education, disciplinary background(s), and research foci and underscores connections among their research networks and digital curation curricula.

We address a fundamental research question: What are the contexts in which digital curation research is being conducted? More specifically: (a) In what disciplinary and institutional contexts are stakeholders conducting digital curation education and research? (b) How do digital curation researchers characterize the field and their own work? (c) How do digital curation researchers describe their current and projected research environments? (d) What are the primary venues of engagement with the digital curation research network?

4. Methodology

Venues

Academic researchers and digital curation practitioners make connections and collaborate with other digital curation scholars in venues such as conferences, journals, symposia, workshops (online or offline), certificate and degree programs, and web-based digital curation discussion groups.

For this study, we collected analyzed contributions to four major venues. These include the *International Journal of Digital Curation*, and three conference series: International Digital Curation Conference, DigCCurr Conference, and the International Conference on the Preservation of Digital Objects (iPRES). Table 1 provides a summary of the venues included in the study.

Venue	Description	Scope of Material Analyzed
The International Journal of Digital Curation (IJDC)	A peer-reviewed journal published twice yearly by UKOLN / the Digital Curation Centre at the University of Bath. It features “papers, articles and news items on curation of digital objects and related issues.” (IJDC website, www.ijdc.net/).	Autumn 2006, July 2007, November 2007, July 2008, November 2008, June 2009, October 2009, December 2009, and July 2010
International Digital Curation Conference	This conference is sponsored by the Digital Curation Centre and has been held seven times as of 2011. It hosts “individuals, organisations and institutions across all disciplines and domains involved in curating data for e-science and e-research and provid[es] an opportunity to get together with like-minded data practitioners to discuss policy and practice.” (DCC website, www.dcc.ac.uk).	IDCC1 (September 2005), IDCC2 (November 2006), IDCC3 (December 2007), IDCC4 (December 2008), and IDCC5 (December 2009).
DigCCurr Conferences	In April, 2007, and April, 2009, the DigCCurr program, based at the University of North Carolina at Chapel Hill (UNC-CH), sponsored international conferences on digital curation. DigCCurr 2007 focused on “what digital curators do and what they need to know to carry out this important work.” Subsequently, DigCCurr 2009 emphasized “Digital Curation Practice, Promise and Prospects.” Funded by the Institute of Museum and Library Services and carried out at the UNC-CH School of Information and Library Science, DigCCurr “seeks to develop an international, doctoral-level curriculum and educational	The study integrated participant information from both conferences.

	network in the management and preservation of digital materials across their life cycle” (www.ils.unc.edu/digccurr).	
International Conference on the Preservation of Digital Objects (iPRES)	iPRES is “a series of international conferences that seeks to address issues and further the art and science of digital preservation by bringing together experts and practitioners from across the spectrum of preservation disciplines” (iPres website, www.ifs.tuwien.ac.at/dp/ipres2010/). It has taken place yearly since 2004.	iPres1 (July 2004), iPres2 (September 2005), iPres3 (October 2006), iPres4 (October 2007), iPres2008 (September 2008), iPres2009 (October 2009), and iPres2010 (September 2010)

Table 1. Venues included in survey.

We gathered contact information for all contributions, whether editorials or peer-reviewed items, including articles, panels, presentations, posters, editorials, workshops, and demos.

For each contribution included within the scope of our study, we extracted author(s) names and the title. Contact information including email addresses, affiliation, and title was obtained through the information provided on the conference program or journal article or simple web searches.

Survey

We sent email invitations to participate in an online survey in April, 2011, to 607 authors and presenters of 686 contributions. The survey consisted of 18 questions (see survey instrument, Appendix A) related to respondents’ student status, intended professional trajectory, degrees earned, job titles, membership in professional associations, attendance at conferences and workshops, journals most frequently read, and disciplines in which they classified their work.

4. Results

By the close of the survey in May, 2011, the total number of surveys started was 209 and the number completed was 180. The response rate overall was 29.65%.

Student participation

Only 11% of respondents (22 of 192) were students when they produced the item in question (Figure 1).

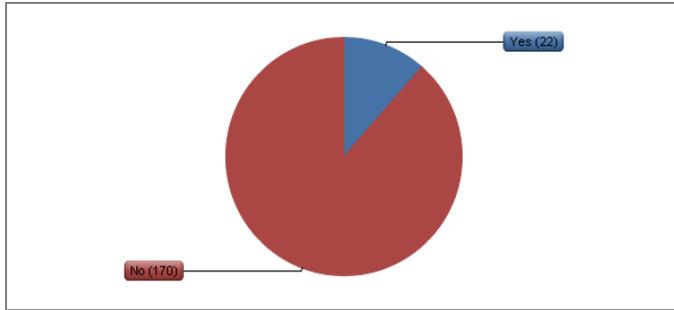


Figure 1. Respondents' student status when producing contribution.

The majority of those who contributed when they were students were doctoral students (Table 1) in schools of information, informatics, or computer science.

Degree type	% (freq) (N=22)
MS	4.5 (1)
PhD	68.2 (15)
Non-degree program	4.5 (1)
No answer	22.7 (5)

Table 2. Degree being pursued at time of contribution (if applicable).

Education

Approximately 81% of the 171 respondents had earned master's degrees and 13.5% had earned two master's degrees. Moreover, nearly 43% (42.8%) had earned doctoral degrees in a range of fields, most commonly in Library and Information Science-related disciplines (28.6% or 22 of the 77 respondents with PhDs). By contrast, 36.4% of the respondents' undergraduate degrees clustered in the arts and humanities and only 3.8% in Library Science, Information Science, or LIS. (Fewer respondents (132) reported BS or BA degrees than reported MS/MA degrees (139); therefore we assume some underreporting of undergraduate degrees.)

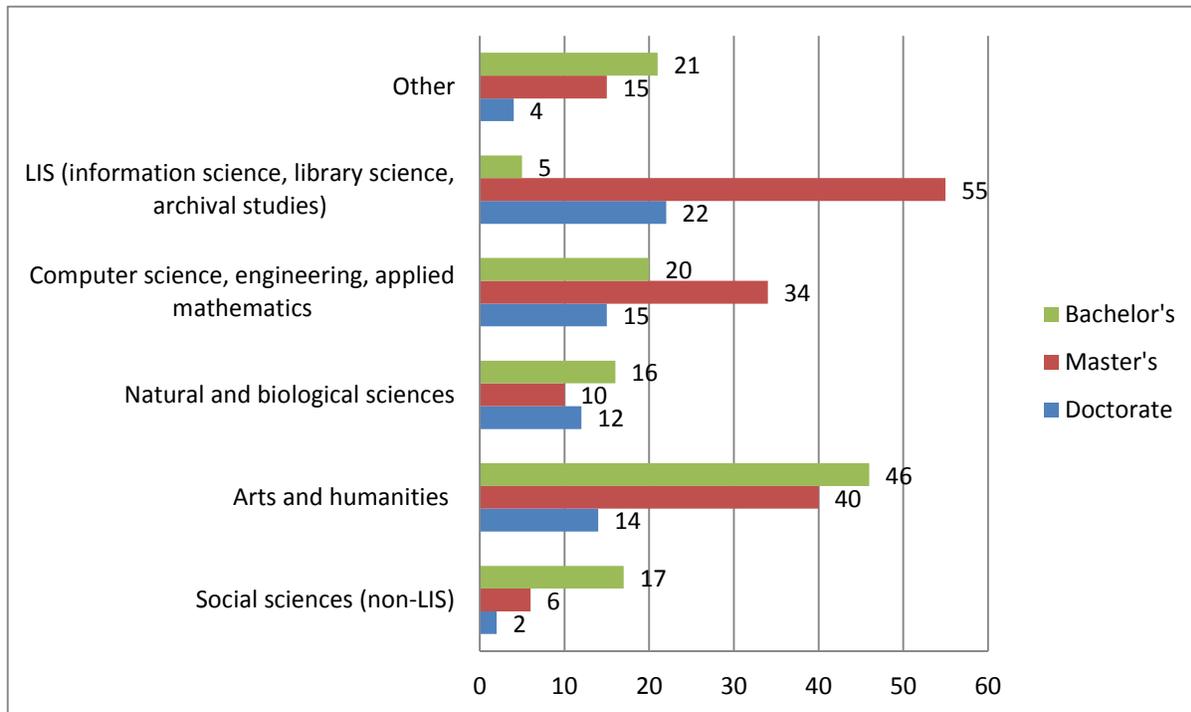


Figure 2. Academic disciplines of respondents' degrees.

Career trajectories

Respondents also indicated their intended post-degree positions (each respondent chose up to three desired positions). The majority of the current students who answered this question (eight of fourteen) intended to seek faculty positions, but three of the fourteen respondents (21%) would consider employment at a private corporation (Table 2).

Employment goals	% (freq) (N=14)
Faculty	40.0 (8)
Post Doc	20.0 (4)
Government	5.0 (1)
Private/Corporate	15.0 (3)
Other	20.0 (4)

Table 3. Post-graduation employment options that students were planning to pursue (more than one answer possible)

Job titles

In order to understand the context in which participants were working, we asked them to report their current job title(s). Titles with functional similarity such as *Director* and *Executive*

Director, President, or Head, were collapsed into a single category. Professorships at any level (Associate, Assistant, and Full Professor) were also collapsed into a single category.

The most frequently reported positions were senior roles (such as *Executive Director* or *Head of Research*) and academic faculty positions. The terms *digital*, *data*, and *curation* appeared less frequently in respondents' job titles. Finally, nearly 43% (42.8%) of respondents have PhDs, but many occupy administrative as opposed to purely academic positions. Findings overall suggest that digital curation is a key responsibility both inside and outside the academy.

Terms	% (freq) (N=178)
Director, Executive Director, President, Head*	24.7 (44)
Research	23.6 (42)
Professor (all levels)	23.6 (42)
Digital	20.8 (37)
Archiv* (archivist, archives, archival)	10.1 (18)
Data	8.4 (15)
Curat* (curator, curation, curatorial)	7.3 (13)
Lecturer	6.2 (11)
Other	5.6 (10)

Table 4. Terms appearing frequently in job titles

Professional associations and organizations

Digital curation is a relatively new and evolving area of research and education. It involves individuals who have affiliations with many other existing professions and disciplines. In order to identify those affiliations, we asked respondents to list up to three current memberships in professional associations or organizations. Table 4 shows the ten most frequently reported associations. Respondents reported membership in more than 140 different organizations. Approximately one-third (33.9%) belonged to one or more of the three most frequently mentioned organizations: the Association of Computing Machinery (ACM), the Society of American Archivists (SAA), and the American Society for Information Science and Technology (ASIST). But none of the five most frequently reported associations is geared specifically toward digital curation research or education.

Association Name	% (freq) (n=124)
Association of Computing Machinery (ACM)	18.5 (23)
Society of American Archivists (SAA)	16.1 (20)

American Society for Information Science & Technology (ASIST)	14.5 (18)
American Library Association (ALA)	8.3 (15)
Institute of Electrical and Electronics Engineers (IEEE)	10.5 (13)
Association for Library and Information Science Education (ALISE)	7.3 (9)
International Association for Social Science Information Services and Technology (IASSIST)	7.3 (9)
American Geophysical Union (AGU)	4.0 (5)
Ecological Society of America (ESA)	4.0 (5)
American Association for the Advancement of Science (AAAS)	3.2 (4)

Table 5. Association memberships.

Conference and workshop attendance

In addition to membership in professional associations, we also wanted to identify the professional events in which respondent participate. We asked them to list the three professional events (workshops, conference or symposia) that they had attended most recently (Table 5). We also asked them to list the conferences (up to three) they had attended most regularly (Table 6). iPRES and IDCC were two of the most frequently cited conferences, perhaps as a result of our sampling technique (selecting respondents who had recently contributed to venues that included iPRES and IDCC). Notably, the Annual Meeting of the Society of American Archivists (SAA) – a venue that we did not include in our sampling frame – was cited as frequently as IDCC.

Conference	% (freq) (N=163)
International Conference on Preservation of Digital Objects (iPRES)	21.5 (35)
International Digital Curation Conference (IDCC)	9.8 (16)
Joint Information Systems Committee (JISC)	8.0 (13)
American Society for Information Science & Technology (ASIST)	6.7 (11)
Coalition for Networked Information (CNI)	4.9 (8)
Association for Library and Information Science Education (ALISE)	4.3 (7)
European Conference on Digital Libraries (ECDL)	4.3 (7)
Society of American Archivists (SAA)	4.3 (7)

Digital Curation Conference (DCC)	3.7 (6)
Open Repositories	3.7 (6)
Association of College and Research Libraries (ACRL)	3.1 (5)
American Library Association (ALA)	3.1 (5)
Digital Library Federation (DLF)	3.1 (5)
Digital Preservation Coalition (DPC)	3.1 (5)
Webwise	3.1 (5)

Table 6. Latest three professional events attended (conferences, workshops, or symposia).

Conference	% (freq) (N = 146)
International Conference on Preservation of Digital Objects (iPRES)	27.4 (40)
International Digital Curation Conference (IDCC)	9.6 (14)
Society of American Archivists (SAA)	8.9 (13)
International Association for Social Science Information Services & Technology (IASSIST)	5.6 (10)
American Society for Information Science & Technology (ASIST)	6.2 (9)
Open Repositories	6.2 (9)
Joint Conference on Digital Libraries (JCDL)	4.8 (7)
Coalition for Networked Information (CNI)	4.1 (6)
Digital Libraries Federation (DLF)	4.1 (6)
American Library Association	3.4 (5)
European Conference on Research and Advanced Technology for Digital Libraries (ECDL)	3.4 (5)

Table 7. Conferences regularly attended.

Journals most frequently read

Another marker of one's disciplinary position and influences can be what journals he or she reads. We asked respondents to list up to three journals or other professional publications (in rank order) that they most often read. The *International Journal of Digital Curation* (IJDC) was the most frequently cited journal, a finding that could again be heavily influenced by our sampling method (contributions to the *IJDC* constituted 128 of the 686 total contributions. Archival journals were also listed frequently. But there was no single journal that all survey respondents read: a wide range of journals publish peer-reviewed digital curation articles, as survey responses indicated.

Journal	% (freq) (N = 144)
<i>D-Lib Magazine</i>	22.9 (33)
<i>International Journal of Digital Curation</i>	22.9 (33)
<i>Journal of the American Society for Information Science and Technology (JASIST)</i>	13.9 (20)
<i>American Archivist</i>	13.2 (19)
<i>Communications of the ACM</i>	9.0 (13)
<i>Ariadne</i>	8.3 (12)
<i>Archival Science</i>	7.6 (11)
<i>Archivaria</i>	6.9 (10)
<i>Science</i>	5.6 (8)
<i>International Journal on Digital Libraries (IJDL)</i>	4.2 (6)

Table 8. Journals or other professional publications that respondents most frequently read.

Describing the discipline

Respondents described (in free text) up to three disciplines in which they classified their research. Many of the 119 respondents included “digital” in their descriptions; however, the term “digital curation” appeared infrequently—only fourteen times in 304 total responses. Respondents used terms and concepts drawn from information, archives or archiving, librarianship, or preservation.

Presentation, article, and workshop titles were classified by their predominant themes. The most common terms used in presentation or journal article titles included *digital*, *preservation*, *data*, *curation*, and *information*. On the other hand, *research* and *science* appeared less frequently. The phrase “digital curation” was used quite infrequently, appearing in only 57 of 607 titles.

Current research and mentoring

Seventy-two percent of respondents reported that they were currently involved in research. Moreover, 53% of respondents reported that they currently had students work with them. These findings bode well for the future of the field: on one hand, the field is increasing its body of knowledge overall; on the other hand, mentoring relationships will likely contribute to the further development of a digital curation invisible college.

5. Discussion

Only a small percentage of respondents (11%) were students when they published their article(s). Of that 11%, 68.2% were PhD students. As much of doctoral education involves socializing students into a relevant Community of Practice, it is important for faculty mentors should encourage students to publish their work. While we do not have any specific data to indicate the number of doctoral students who are pursuing research related to digital curation or whether that number is increasing, it will be interesting to see whether the amount of published research being undertaken by doctoral students will increase in years ahead.

While 40% of student responses indicated respondents' plans to pursue faculty positions, 15% of responses indicated that students were amenable to private sector positions. This finding suggests a new possibility for private and non-profit partnerships in digital curation education.

Most respondents had earned undergraduate degrees in the arts and humanities. More than 80 percent of the 171 respondents (81.3%) had earned master's degrees. While nearly 40 percent (39.6%) of the 139 respondents with Master's degrees had earned them in Library Science, Information Science, or LIS, less than a quarter (25.2% or 35) had earned them in Computer Science, Engineering, or Applied Mathematics and fully 28.8% (40) had earned them in Arts or Humanities. Additionally, more than forty percent (42.8%) of respondents had earned PhDs, but here a more variegated pattern prevailed. Of those 77 respondents with PhDs, nearly as many had earned them in Computer Science, Engineering, or Applied Mathematics (29.9%) as in LIS (28.6%).

This educational diversity helps to explain the range of skills shown by those responsible for digital curation. There is no set career path for digital curation; many of those who "do" data come to the work "by accident" (Pryor and Donnelly 2009). On the other hand, Pryor and Donnelly's findings suggest another question: should there be a more linear career path for digital curation professionals? While digital curation education efforts like DigCCurr II concentrate on doctoral-level education, perhaps efforts also should be extended upstream; doctoral students could recruit undergraduates and Master's degree students into digital curation doctoral programs. Finally, perhaps part of the doctoral curriculum could involve mentoring by PhD students of their peers.

Respondents' job titles were mainly senior-level roles or faculty positions. As senior-level personnel, respondents may have considerable leverage to advocate for digital curation educational initiatives. Similarly, such senior professionals should make concerted efforts to mentor students in line with the apprenticeship model that funnels into a healthy Community of Practice (Duguid 2005). On the other hand, few job titles included the term "curation" or its permutations. This again suggests the newness of the field and questions about whether "digital curation" will establish itself as a well-defined professional category.

Few job titles included "curation" and none of the five most frequently reported associations to which respondents belong focuses specifically on digital curation. Unsurprisingly, respondents participate in a wide range of conferences, journals, and associations. The predominant venues, however, relate to the information professions (libraries, archives, and information science). The International Digital Curation Conference, however, was the second-

most frequently reported conference respondents attended regularly. Finally, the Digital Curation Centre will remain a locus for conversations engendered in these venues (Beagrie 2004, Rusbridge et al. 2006, Hockx-Yu 2007).

When asked what journals or other professional publications they most often read, the most frequent response was the *International Journal of Digital Curation*. Again, this finding could be at least partially due to the sampling frame of our study, but it does suggest that IJDC serves as an important vector for digital curation research dissemination and consumption. Overall, associations, conferences/workshops, and journals respondents most frequently read suggest the cross-pollination between digital curation and archival science (Ross 2007, Gilliland 2000). This relationship could be cultivated further and more overtly.

Future research:

Future research should first explore what institutions (beyond those elaborated at the beginning of this paper) are embarking upon doctoral-level digital curation education initiatives and how they are going about the process? For those institutions that have pursued such initiatives, what lessons have they learned and what stakeholders can those lessons benefit? Such lessons should serve as a focus of conversation among high-level personnel such as key administrators.

Second, research could examine current training and apprenticeship roles and responsibilities in digital curation doctoral education. How well are such training and apprenticeship efforts working according to students and according to faculty?

Third, future research could examine whether other venues might be established to further nurture a digital curation doctoral community. For example, associations, conferences and workshops, and journals could cater to doctoral students by establishing student roundtables, electronic mailing lists, panels, and the like. An award for best student paper on digital curation could be implemented by *IJDC*.

Finally, research could investigate the appropriate models for funding and resources for doctoral student education in digital curation. The Institute of Museum and Library Services has demonstrated steadfast support in the past, but new sources must be recruited. Partnering and pooling resources with other institutions such as state libraries, as did the University of Arizona, is a promising strategy.

6. Conclusions

Consonant with the DigCCurr II agenda, documenting the development of the field of digital curation helps digital curation educators use sound research findings to refine pedagogical practices. Indeed, digital curation doctoral education demands such an “ecological” perspective (Choudhury 2010). Stakeholders more generally must remain ever-vigilant, communicating among one another about what roles, responsibilities, and career choices are involved in “skilling up” to tackle digital curation in a remarkable and burgeoning variety of contexts (Pryor and Donnelly 2009).

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Appendix A

DigCCurr II Survey of Research and Education in Digital Curation

Were you a student at the time you produced the item listed above?

Student situation and goals:

- Degree you were pursuing
- University and unit (e.g. department, institute, center, school) in which the degree you were pursuing would be awarded
- Name and affiliation of your primary academic advisor
- If you had more than one academic advisor, please provide the name and affiliation of others
- Year you entered the program of study

Are you still in the program of study described above?

If no, then reason why:

- Completed the degree
- Left the program

If yes, then:

Of the following options for employment after you complete your degree, please indicate which you are planning to pursue:

- Faculty position at a university
- "Postdoc" fellowship or research associateship
- Traineeship
- Internship, clinical residency
- Government position (excluding university)
- Private sector/corporate position
- Nonprofit sector position (excluding university)
- Other (please specify)

What is your current job title (list more than one, if applicable)?

Who is your current employer (list more than one, if applicable)

Please list your educational degrees and the subject areas in which you received them [For each: degree type, degree field, institution]

Please list any professional certifications you have received.

Please list up to three professional association or organizations to which you belong:

What were the latest three professional events (conferences, workshops, or symposia) that you attended?

What three conferences do you attend regularly?

Please list up to three journals or other professional publications (in rank order) that you most often read.

Are you currently engaged in research?

Please provide a description of your current research (free text of up to 500 words). Also feel free to provide a link to further online information about your research.

If you were to place a name on the disciplines(s) to which your research will contribute, what name(s) would that be? (If you list more than one, please provide them in rank order – from the name that most closely matches your work to the one that least closely matches.)

Do you have students working with you on your research?

In order to further investigate the social networks in this area of research, we would appreciate it if you could provide the names and institutional affiliations of the students who are working with you on your research: