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TOWARD A DIGITAL CURATION CURRICULUM FOR MUSEUM STUDIES: A NORTH AMERICAN PERSPECTIVE

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"There is a pressing requirement for education and training in new digital archiving methods, tools, and technologies."

-"It's About Time" NSF/LC Report, 2002 [1]

Abstract

The Institute for Museum and Library Services (IMLS)-Funded "DigCCurr" (Digital Curation Curriculum) project is addressing the need for more extensive professional education for digital curators (http://www.ils.unc.edu/digccurr). A collaboration between the School of Information and Library Science (SILS) at the University of North Carolina at Chapel Hill (UNC-CH) and the US National Archives and Records Administration (NARA), this project is developing an openly accessible, graduate-level curricular framework, course modules, and experiential and enrichment components and exemplars necessary to prepare students to work in digital repositories that span the heritage, educational, commercial, governmental, and scientific sectors.

One principle that underlies the DigCCurr perspective is that while each work environment may require specific disciplinary or contextual knowledge, prospective curators also need to learn and adopt a range of common skills, knowledge, and values that transcend employment in a particular

type of repository such as a library, museum, or archives. The Faculty of Information Studies (FIS) at the University of Toronto (U of T) is exploring such synergies and commonalities across its programs and degrees for librarians, archivists, and museum curators.

Using responses from a survey FIS administered to Museum Studies graduates, this paper will explore the applicability and usefulness of this framework for supporting digital curation education for museum professionals. Data analysis will yield implications for Museum Studies programs and for graduate-level digital curation programs seeking to educate individuals to manage and preserve digital objects across their life spans in a range of cultural heritage repositories.

INTRODUCTION

Digital Curation. Curation of digital assets, whether cultural, educational, scientific, or economic, is one of the central challenges of the early 21st century [2-17]. The last decade has witnessed extensive progress toward robust repository architectures, [18-24] preservation tools and strategies, [e.g., 25-37] and trustworthy and sustainable digital curation (DC) [38-42]. Key projects provide a firm foundation for ongoing research and development [43-55]. This work and the growing recognition that "one of the major challenges of this scientific generation [is] how to develop the new methods, management structures and technologies to manage the diversity, size, and complexity of current and future data sets and data streams," led the U.S. National Science Foundation (NSF) in March 2007 to call for "developing a coherent data cyberinfrastructure in a complex global context" and a "national digital data framework" [56, p. 23-24]. This vision has more recently resulted in the NFS's $100 million "Sustainable Digital Data Preservation and Access Network Partners" (DataNet) program [57].

Digital curation is essential not only for the sciences, but also for preservation of cultural heritage materials as well. [58-62] Successful digital curation requires not only a cadre of digital curation professionals to work in libraries, archives, museums, data centers, and information-intensive organizations as well as new types of organizations envisioned by NSF for the sciences

[16]; it requires staff with a different set of skills, especially in terms of technical expertise, than did the libraries, archives, and museums of the paper-based world.

Education of Digital Curators in Libraries, Archives, and Museums. Six years after the "It's About Time" report [1], the need for education and training of digital curation professionals is more pressing than ever. The terms "digital curation" and "data curation" have emerged to represent more complex and dynamic undertakings than preservation alone. "Digital curation" can be defined as "the active management and preservation of digital resources over the life-cycle of scholarly and scientific interest, and over time for current and future generations of users."[63] It involves "maintaining and adding value to a trusted body of digital information for current and future use;" [64] and is "key to reproducibility and re-use."[63] The Digital Curation Unit of the Athena Research Center in Athens supplies a complementary approach to digital curation based on eight processes: appraisal; ingesting; classification, indexing and cataloguing; Knowledge enhancement; presentation, publication and dissemination; user experience; repository management; preservation; and three subprocesses: goals and usage modeling, domain modeling, and authority management. [65] This model appears a good match to the digital curation curriculum framework being developed in the School of Information and Library Science (SILS) at University of North Carolina at Chapel Hill (UNC-CH).

Limited graduate educational opportunities in digital curation exist [66]. Several disciplines and professions have developed de facto practices and expertise in aspects of digital curation without guiding principles or an overarching vision of data preservation and reuse. Professional education for digital curation has generally involved on-the-job training and experimentation, possibly supplemented by workshops lasting a few days [e.g., 67-73]. In North America, the University of Illinois at Urban-Champaign (UIUC), the University of Texas at Austin, and the University of Michigan offer specializations or certificates in digital curation and UNC is producing a master's level digital curation curriculum and certificate reported here, but little else is found. [74-77] A review of a sample of top-ranked ALA-accredited information and library science (ILS) graduate programs provides evidence that while some schools offer courses in

digital preservation and digital libraries, few make such coursework required, and even fewer offer much in terms of life-cycle digital object management content. Additionally, few faculty list "digital preservation" or "digital curation" as their specializations. Only one US-based graduate program, UIUC, provides a concentration in data curation at the master's level. [73]

Museum Studies Programs currently offer even less in the way curation of digital objects than do archival, library, and information science programs. A search of the web on the terms "museum studies" and "digital curation" or "museum studies" and "digital preservation" provide no hits related to educational programs although the MSP at the University of Athens does list a "Museums and New Technology" course. [78] Given the increasing amount of digital content held in museums, including digitized images of collections, multimedia art, and digital content held in science museums, there appears to be a significant gap between the education of information specialists who will work in museum settings and the realities they will be facing in the workplace.

Digital Curation Education Framework and Museum Studies. This paper explores the general applicability and usefulness of the digital curation curricular framework under development at SILS at UNC for supporting digital curation education for museum professionals. While designed primarily for education of digital curators in archival, library, and data repository settings, we believe it is extensible and adaptable and that it will provide a guide for the development of digital curation content for Museum Studies programs as well. As an exploratory study, we compare the UNC framework to the findings of survey of alumni from the University of Toronto's (U of T) Faculty of Information Studies (FIS) Museum Studies Program (MSP) regarding the MSP and the museum studies field. This survey specifically addresses their views concerning the long-term management of digital content and which elements of their education they found most useful in obtaining professional placements.

DIGITAL CURATION CURRICULUM AT UNC-CH

The School of Information and Library Science at the University of North Carolina at Chapel Hill received a three-year grant from the Institute of Museum and Library Services (IMLS) in June 2006, titled "Preserving Access to Our Digital Future: Building an International Digital Curation," referred to in this paper as the Digital Curation Curriculum (DigCCurr) project. This work is a collaboration of SILS and the U.S. National Archives and Records Administration (NARA). Key goals of the project include developing a graduate-level curricular framework, course modules, and experiential components to prepare students for digital curation work in a wide variety of environments. DigCCurr has an Advisory Board of experts from Australia, Canada, Italy, the Netherlands, New Zealand, the United Kingdom and the United States. In addition to supporting curricular development, the grant provides funding for a set of five Carolina Digital Curation Fellows who began their coursework in August 2007 in pursuit of their graduate degrees. Along with classes in digital curation they will also benefit from four semesters of practical field experiences at one of five UNC-CH repositories. The DigCCurr project also includes two international symposia to engage librarians, archivists, museum professionals, data curators, scholars, other information professionals and the general public in discussions on issues of digital curation and digital curation education. The first symposium, DigCCurr2007, was held April 18-20, 2007 at UNC-CH [79]. The second symposium is scheduled for April 1-3, 2009, to coincide with the culmination of DigCCurr's three-year grant period [80].

Based on an analysis of numerous data sources including semi-structured interviews with our Advisory Board, analysis of relevant syllabi from SILS, UNC-CH, and other institutions; attending conferences, workshops, and expert meetings; analyzing job postings for digital curation positions; and a review of existing literature, we have developed a six-dimensional

matrix of digital curation knowledge and competencies (see Figure 1), and a 28-point, high-level categorization of digital curation functions that underlie the curricular framework (see Figure 2). Each unit of curriculum content will address one or more dimensions. A curriculum unit can focus on a dimension in general or specifically as it intersects with one or more other dimensions. For example, one could teach a general unit on digital preservation (main considerations and practices), but one might also want to teach a unit specifically on preservation of video, images, or text; during the active use stage or within the archival environment; within a corporate recordkeeping context, or within a collecting repository environment or some combination thereof.

1. Type of Resource
- Level of Aggregation
- Level of Abstraction
- Medium
- Format
- Genre

2. Functions and Skills [see below]

3. Professional, Disciplinary or Institutional/Organizational Context
- Professional Context
- Disciplinary Context
- Institutional/Organizational Context

4. Mandates, Values and Principles
- Ethics
- Legal Requirements
- Standards
- Interoperability and Sustainability Requirements

5. Prerequisite Knowledge
- Terminology
- Characteristics of Technologies

6. Lifecycle Stage
- Pre-Creation Design and Planning
- Creation
- Primary Use Environment (Active Use)
- Transfer to Archives
- Archives (Preservation Environment)
- Transfer Copies or Surrogates to Secondary Use Environment
- Secondary Use Environment

Figure 1. Matrix for Curriculum Development

During the first phase of DigCCurr, we have devoted considerable attention to the development of a taxonomy of functions and skills. This is an iterative process; we expect that the taxonomy will undergo significant revision based on further analysis of received comments and collected literature, syllabi, and job postings. Figure 2 contains the top-level categories from the current draft of our taxonomy. It is supported by an extensive list of more specific functions and skills for each primary category.

DigCCurr Functions and Skills
1. Systems Engineering and Development
2. Production
3. Selection, Appraisal and Disposition
4. Identifying, Locating and Harvesting
5. Transfer
6. Ingest
7. Data Management
8. Description, Organization and Intellectual Control
9. Archival Storage
10. Management
11. Administration
12. Preservation Planning and Implementation
13. Access
14. Use, Reuse and Adding Value to Accessed Information
15. Reference and User Support Services
16. Common Services
17. Destruction and Removal
18. Collaboration, Coordination and Contracting with External Actors
19. Advocacy and Outreach
20. Analysis and Evaluation of Producer Information Environment
21. Analysis and Characterization of Digital Objects/Packages
22. Validation and Quality Control of Digital Objects/Packages
23. Transformation of Digital Objects/Packages
24. Purchasing and Managing Licenses to Resources
25. Analysis and Documentation of Curation Functions
26. Evaluation and Audit of Curation Functions

27. Research and Development to Support Curation Functions
28. Education and Sharing of Expertise or Guidance on Curation Functions

Figure 2. High Level Categories of Digital Curation Functions

The DigCCurr project is now in the midst of creating course modules to populate the matrix within the context of the overall SILS curriculum. We will post the framework and modules to the Web and encourage instructors in digital curation worldwide to use these materials and add to them. It is the purpose of this current study to explore the extensibility of the curriculum, primarily designed for library, archive, and information science students, to the Museum Studies arena.

MUSEUM STUDIES AT THE UNIVERSITY OF TORONTO

On July 1, 2006, the Museum Studies Program, a two year master's degree program at the University of Toronto, became part of the U of T's Faculty of Information Studies. The MSP had existed as an autonomous unit for over thirty years, graduating more than 400 students during that time. To better understand the MSP and the museum field, the Interim Program Director decided to conduct a survey of the MSP alumni. The purpose of the survey was to gather information about the graduates' perceptions of the Museum Studies Program and their perceptions of the museum studies field.

Research Questions. Two research questions about the graduates' perception of their master's program, and three questions related to their perceptions of the museum field guided the survey:

Perceptions of their master's program:

1. What are the graduates' perceptions of the quality of their master's program in Museum Studies?
2. Do graduates' perceptions of the quality of their master's program change in the years following graduation? If so, in what ways?

Perceptions of the museum field:

3. What are the professional experiences of museum studies graduates?
4. What do graduates perceive to be the necessary knowledge and skills in the museum profession?
5. What are the graduates' perceptions of the job prospects in the museum field?

Methodology. During the academic year 2006-2007, we compiled a database of 422 graduates' names and began searching for current addresses for all Museum Studies alumni. We were able to identify only 266 current addresses. We mailed letters informing graduates of the survey and inviting them to participate. We received seventeen unopened envelopes, noting that the addressees had moved. In total we had valid addresses for only 249 graduates. We received 179 completed questionnaires, a 71.9% response rate.

The administration of the survey drew heavily on Dillman's Tailored Design Method (2000) [81]. On November 2, 2007, we sent an advance letter notifying graduates of the imminent arrival of the questionnaire and its purpose. We sent a questionnaire package, consisting of a cover letter, the questionnaire, a stamped return envelope, and a brightly coloured draw ticket. We numbered each return and mailing envelope to track respondents. We sent a follow-up letter to the alumni two weeks later. Finally a month after we had sent the questionnaire packages we mailed a final follow-up letter, a questionnaire, a stamped return envelope, and a draw ticket to anyone who had not yet returned their questionnaire. The draw was for five $100 gift certificates to the Smithsonian online store. Respondents needed to return their questionnaire before a certain date to be entered into the draw.

The Questionnaire. We adapted many of the questions for the survey from a questionnaire developed for the Masters of Information Studies (MISt) program at FIS, and an Alumni Questionnaire developed by the Department of Chemical Engineering and Applied Chemistry, University of Toronto. The resulting MSP questionnaire was divided into three sections.

Section 1 solicited information about the Master's program and contained six questions; Section 2 contained seven questions about the graduates' careers; and final section gathered demographic information. Museum studies faculty members reviewed the questionnaire and made suggestions for changes. We pre-tested the questionnaire on eleven individuals including three students in the 2nd year of the program, three information professionals who worked at FIS, and two graduates from another museum studies program. We revised the questionnaire based on their comments.

Profile of Respondents. As shown in Table 1, 79.5% of respondents were female and 50.5% of respondents were 41 years or older. Most of the respondents had worked in the museum field with 44.6% of respondents having worked for more than ten years, and 18.9% of respondents having worked for six to ten years. Less than 6% of respondents (5.7%) had never worked in the field. We asked the alumni whether they had obtained another degree after their Museum Studies program, and 8.7% of respondents reporting having obtained another master's degree and 13.4% reported having completed a PhD.

Sex	
Male	20.5%
Female	79.5%
Age	
30 or under	15.3%
31-40	33.5%
41-50	20.5%
51-60	25.5%
61+	4.5%
Years worked in field	
Never	5.7%
Less than 1 year	8.6%
1-5 years	22.3%

6-10 years	18.9%
More than 10	44.6%
Post MMSt Degrees	
Other master's	8.7%
PhD	13.4%

Table 1: Profile of the Respondents

The Findings. The data from the survey suggests that MSP graduates disagreed over whether a museum studies program should contain a large practical component or whether the degree should be more theoretical. When asked to elaborate on their level of satisfaction with the program, nineteen respondents noted the need for more practical or hands-on courses. For example, one respondent stated,

> "I entered the program under the impression that it would be more practice oriented and found it extremely heavy on theory, which while interesting, did not truly prepare me or help me in gaining employment in the sector."

On the other hand, twelve respondents discussed the theoretical aspects of the program. One respondent suggested,

> "Museum Studies is a rare combination of a professional and academic discipline - finding that balance is essential to attracting future students and faculty."

In a similar vein, one respondent suggested strengthening the critical component of the program. In responding to the question asking for more comments, he/she noted,

> "There are plenty of practical courses available in Canada, so please reduce the practical content & increase the critical. You should be generating Museum Directors NOT technicians."

To understand better the type of knowledge and skills needed by professionals working in the museum field and to address research question 4, "What do graduates perceive to be the necessary knowledge and skills in the museum profession," we asked respondents to indicate whether or not different areas of knowledge and skills had been important in their career. The question asked them to indicate the extent to which they agreed or disagreed, on a scale of 1 to 5, with 1 being "Strongly Disagree" and 5 being "Strongly Agree," with a statement indicating that an area of knowledge or skill had been important. We tabulated the number of respondents who indicated that they either "Agreed" or "Strongly Agreed" with the statement. As shown in Table 2, the data suggests that respondents rated the skills related to oral communication (95.5%) teamwork (90.4%) and computers (82.5%) higher than any specific area of knowledge related to the museum field.

Knowledge and Skills	**# of Respondents Indicating 4 or 5**	**Percentage of Respondents Indicating 4 or 5**
1. Oral communication skills have been important in my career	169	95.5%
2. Skills in teamwork have been important in my career	160	90.4%
3. Computer skills have been important in my career	146	82.5%
4. Knowledge of public/education function have been important in my career	139	78.5%
5. Knowledge of management have been important in my career	136	76.3%
6. Knowledge of exhibition development have been important in my career	129	72.9%
7. Knowledge of research methods have been important in my career	122	68.9%
8. Knowledge of collections management have been important in my career	121	68.4%

Knowledge and Skills	# of Respondents Indicating 4 or 5	Percentage of Respondents Indicating 4 or 5
9. Knowledge of curatorial practice have been important in my career	118	66.7%
10. Knowledge of visitor/audience response have been important in my career	114	64.4%
11. Knowledge of conservation have been important in my career	104	58.8%
12. Knowledge of legal matters have been important in my career	97	54.8%
13. Knowledge of museum theory have been important in my career	93	52.5%
14. Knowledge of fundraising have been important in my career	75	42.4%

Table 2. Knowledge and Skills Important for Career
(n=177)

Among the different areas of knowledge, over three-fourths of the respondents indicated that public/education (78.5%) and management (76.3%) had been most important in their careers and 72.9% of respondents agreed that exhibition development was important. Only about half of the respondents reported that fundraising (42.4%), museum theory (52.5%), and legal matters (54.8%) had been important in their careers.

We also asked respondents if they would be interested in attending a workshop, a graduate course, a certificate, or a PhD in museum studies if provided at the U of T. Of the 176 respondents who answered this question: 50 respondents reported interest in attending a workshop; 28 respondents suggested they would be interested in attending a graduate course; 36 respondents indicated interest in a certificate program; and 35 respondents showed interest in a PhD in museum studies. A follow-up question asked respondents to record the topics that would interest them. This question was open-ended and one researcher and an assistant coded the replies. As shown in Table 3, the respondents most frequently mentioned topics related to New Media (20), Management/Finance/Budgeting/Project Management (20) and Collections Management/Legal Issues/Privacy (19).

Topics	Number of respondents who mentioned topic
New Media	20
Management/Finance/Budgeting/Project Management	20
Collections Management/Legal Issues/Privacy	19
Exhibition related	16
Visitor Studies/Audience Research/Evaluation	16
Curatorial Practice/Research Methods/Culture Studies	15
Programming	11
Development/Marketing/Fundraising	10
Education	10
Interpretive Planning	7
Community Issues	6
Information Management	3

Table 3: Topics for Educational Opportunities

We also wanted to gather feedback on two specific courses offered in the program: the research paper/thesis and the 2nd year exhibition course.[1] Because the program has changed over the years, we first asked students if they had completed the research paper/thesis or the 2nd year exhibition course. Ninety-four percent of the respondents (169 respondents) indicated they had completed a research paper/thesis, while only 71% of respondents (123 respondents)[2] indicated they had completed the 2nd year exhibition course. We asked respondents who reported completing the research/paper to indicate on a scale from 1 to 5, with 1 being "Not at all valuable" and 5 being "Extremely valuable," how valuable the research paper/thesis was in developing research skills and gaining employment. Of the 168 respondents who answered these questions, 33.3% of respondents (56) indicated that the research paper/thesis was extremely valuable in developing research skills, but only 9.5% of respondents (16) indicated that it was extremely valuable in gaining employment. We also asked respondents who indicated

[1] The exhibition course requires all students in the class to design and mount a single exhibition. They need to research, borrow and mount objects, design, and raise funds for the exhibit.
[2] Only 174 respondents answered this question.

completing the 2nd year exhibition course to note on a scale from 1 to 5, with 1 being "Not at all valuable" and 5 being "Extremely valuable," how valuable the exhibition course had been in developing practical skills and gaining employment. Of the 124 respondents who answered these questions, 19.2% of respondents (24) indicated the exhibition course was extremely valuable in developing practical skills, but only 5.6% of respondents (7) indicated that it was extremely valuable in gaining employment.

DISCUSSION

Many of the issues the U of T MSP alumni raised are covered by the SILS draft digital curation curriculum. Some aspects of the nine of the top ten areas of knowledge and skill that the alumni believe have been the most important to them in their careers are already represented in the DigCCurr curriculum. Table 4 provides a comparison between the DigCCurr categories and those of the MSP alumni. This comparison takes into account more detailed second-level categories from the list of skills and functions. It is important to note that what the graduates mean by some of their categories is not necessarily completely covered nor is it necessarily clear without clarified terms or some sort of interview protocol. For example, the public education function in a museum is very different than archival or library reference, but both require knowledge of users and how to communicate with them and link them to the information or museum experience they want or need. While not identical, such functions have similar knowledge and skills requirements and each profession might enhance their field from learning from the other.

MSP Survey Knowledge and Skills	DigCCurr Category*
1. Oral communication skills	11. Administration
2. Skills in teamwork	11. Administration 18. Collaboration, Coordination and Contracting with External Actors

MSP Survey Knowledge and Skills	DigCCurr Category*
3. Computer skills	1. Systems Engineering and Development 7. Data Management 9. Archival Storage 12. Preservation Planning and Implementation 21. Analysis and Characterization of Digital Objects/Packages 22. Validation and Quality Control of Digital Objects/Packages 23. Transformation of Digital Objects/Packages
4. Knowledge of public/education function	13. Access 15. Reference and User Support Services 19. Advocacy and Outreach
5. Knowledge of management	7. Data Management 10. Management 11. Administration
6. Knowledge of exhibition development	19. Related to Advocacy and Outreach (public programming) and production of exhibits within repositories
7. Knowledge of research methods	27. Research and Development to Support Curation Functions
8. Knowledge of collections management	3. Selection, Appraisal and Disposition
9. Knowledge of curatorial practice	
10. Knowledge of visitor/audience response	27. Research and Development to Support Curation Functions (user needs analysis and user-based evaluation methodologies)

*Other categories may also address these functions and skills. These are the primary high-level categories.

Only "knowledge of [museum] curatorial practice," a category specific to Museum Studies, does not appear in the DigCCurr curriculum. Thus, at least in terms of the perceptions of the MSP graduates from the U of T as we understood them, the digital curation curriculum provides a hospitable framework. What is significantly different, however, is the terminology used by the museum community and the library and archives communities represented in the DigCCurr curriculum.

NEXT STEPS

The preliminary evidence from this study indicates that some of the knowledge fundamental to digital curation is also key to the museum studies field. Furthermore, we believe that by exploring the museum studies curriculum we might find new areas or topics that may highlight other skills and knowledge that would be beneficial to the digital curators. In the next phase of the project we will study the content of existing museum studies programs in greater depth, and compare them with the draft DigCurr curriculum. We will also compare this framework to the International Council of Museums' (ICOM) Curricula Guidelines. [82] The ICOM guidelines define five broad areas of competencies - general descriptions of knowledge, skills and abilities needed to work effectively in today's museums - museology, management, public programming, information and collections management and care, and general competencies such as communication and financial skills. A cursory comparison shows that much of digital curation competencies would fall in the "information and collections management and care" category.

Another task will be not only to map the museum the necessary functions and skills among the library, archives, and museum domains, but to translate the terminology that represents these functions. For example, the term "curation," originating in the museum community, needs to have a very clear definition and usage in the digital sense that accommodates the museum world as well as archiving and digital preservation. With the framework articulated for all stakeholder communities, museum studies educators can use it to further develop collection management and care pedagogical tools. We would welcome any thoughts or suggestions on particular programs we should study or tools to use in the next phase.

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