Themes in Recent Research on Integrating Primary Source Collections and Instruction

Sonia Yaco, Arkalgud Ramaprasad, and Thant Syn

abstract: This paper infers the dominant, nondominant, and overlooked themes in recent research on integrating primary source collections and instruction. The authors analyzed data on 75 publications to determine relationships among the themes. The results show that the three most common themes for linking curriculum to primary sources are (1) to create, access, and describe data about cultural heritage artifacts and courses; (2) to match literary collections to classroom activities and research areas, and (3) to help students to investigate, and faculty to educate about, cultural heritage.

Introduction

Mark Greene declared, “Advancing the use of archival records in the curriculum should be considered an important part of, rather than an alternative to, the ‘administrative’ duties of the archivist.”1 Greene’s statement, from 1989, has become a reality in the succeeding decades. Today, a central goal of academic cultural heritage institutions, including archives, is to promote curricular use of their collections. Literature abounds with case studies, surveys, and guidance on the myriad ways that archivists, librarians, curators, and historians link primary source collections to courses.2 This study (1) presents an ontological framework showing the relationships between the techniques that can help to succinctly describe them; (2) uses the frame-
work to map current research on the intersection of libraries, archives, and museums with curriculum; and (3) analyzes correlations within the mapping to identify research emphases and gaps. Emphases will be referred to as bright, infrequent research areas as light, and gaps as blank.

The authors did a cluster analysis of 75 publications, grouping observations so that those in the same cluster were more similar to one another than to those in other clusters, and then studied them through the lens of an ontological framework. Results show that the most common or “bright” practice for linking curriculum to primary sources is matching cultural heritage data to research areas. Among the least common or “blank” techniques is to link collections to learning outcomes to help university administrators preserve cultural heritage.

The central question of this study is whether there are emphases or gaps in how professionals—particularly archivists—match primary source collections to university curriculum. A framework that shows the intersection of the educational and cultural heritage domains can be a starting point to answer this question. Sonia Yaco envisions a “Cultural Heritage and Curriculum Crosswalk,” a chart or diagram, that indicates the correspondence between the two domains by aligning cultural heritage collections with relevant courses. Yaco, Arkalgud Ramaprasad, and Saleha Ravi developed an ontological framework to describe the crosswalk. The framework is intended to describe the “problem domain,” that is, the area that must be examined to solve the problem. The framework also serves to report current research and provide a structure for solutions. This paper uses an updated ontological framework to map current research and practice as reflected in the literature.

To begin, the ontological framework will be laid out and the literature will be mapped to the framework. This mapping will also serve to test whether the pathways depicted in the ontological structure are valid within the problem domain. After presenting the results and findings, the article will conclude by discussing implications for future research.

**Ontological Approach**

The literature that describes and explains the challenges of integrating collections with instruction takes almost entirely the form of narrative, with few frameworks or schemata. It is voluminous and distributed across many disciplines, including library science, cultural heritage, history, education, and informatics. The challenges reported are mostly incremental, sequential, and local to the respective disciplines. It is difficult to obtain a systemic view of the issues from these individual narratives.

An approach to obtain a systemic view of the challenges is to use a tool from the field of decision sciences, a structured natural language framework or ontology. An ontology simply organizes the terminologies, taxonomies, and narratives of the domain into the form of a text-table. This structure articulates and makes visible the core logic of the domain in structured natural English that may be awkward grammatically but is understandable. Thus, an ontology can be used to present the core logic of the challenges concisely and clearly.

Historically, ontologies have seldom been used in the cultural heritage-instruction domain. A recent exception is the CIDOC-CRM (International Committee for Docu-
mentation-Conceptual Reference Manual) framework. It addresses the data structure of the domain, the data elements, and their semantic interoperability. Complementary to CIDOC-CRM are ontologies proposed by Yaco and Ramaprasad; by Yaco, Rizvi, and Ramaprasad; and by Yaco, Ramaprasad, and Rizvi. This stream of research draws upon the method of ontological meta-analysis and synthesis proposed by Ramaprasad and Thant Syn and applied to many domains. Ramaprasad, Chetan Dixit, Priyansha Rawat, Swati Singh, and Vijeth Acharya present a systematic, exhaustive analysis of India’s antiquities laws using an ontological framework. Joshua Cameron, Ramaprasad, and Syn, for example, propose an ontology for mHealth (mobile health), the use of mobile phones and other wireless technology in medical care. Cameron, Ramaprasad, and Syn map the published research literature in the domain in a year, analyze the gaps within it, and propose a road map for future research. Similarly, Christian Cancino, Ariel La Paz, Ramaprasad, and Syn synthesize the scientific literature on technological innovation for sustainable growth using an ontology. The latter ontologies are less abstract (compared to the CIDOC-CRM framework), address the conceptual elements of the domain, and emphasize semantic interpretability. The two types of ontologies can inform each other to advance the domain.

At the basic level, the ontology is a compilation of all the elements, the nouns and verbs, necessary for collection-instruction integration. These elements are defined in the Glossary in Appendix A. They and their definitions have been derived from many sources in the disciplines mentioned earlier. At the next level, the elements are grouped into dimensions, each represented by a column of the ontology.

For collections-instruction integration, the proposed ontological framework shown in Figure 1 describes the methods, stakeholders, and goals of connecting cultural heritage and curriculum using dimensions (columns) and elements (rows). The dimensions consist of functions, semiotics, cultural heritage, teaching and instructional materials, agents, and outcomes and are described in the “Taxonomy” section later (for more detail, see the Glossary in Appendix A).

The dimensions of the ontological framework are arranged left to right with adjacent words or connectors, such that concatenating an element from each dimension with the connectors creates a natural English sentence, illustrating a potential pathway of the crosswalk. The pathways define the crosswalk. For instance, “A system to access data-cultural heritage to match literary collections and assessment to aid donors to contextualize cultural heritage.” The “system” described may be human, computer, or a process.

Taxonomy of Dimensions

The taxonomy of functions has been adapted from the behaviors of professionals in library science and archives, who arrange, describe, and access; and from traditional computer science functions, such as create, authenticate, and distribute. Information science provides the taxonomy of semiotics, the academic study of how signs and symbols, both visual and linguistic, create meaning. The United Nations Educational, Scientific and Cultural Organization (UNESCO) definitions of 1970 and 2003 are used to form the taxonomy of cultural heritage. The definitions of several key cultural heritage elements are noteworthy. Literary cultural heritage includes most of the holdings of libraries and
### Cultural Heritage and Curriculum Crosswalk: An Ontology

<table>
<thead>
<tr>
<th>Functions</th>
<th>Semiotics</th>
<th>Cultural Heritage</th>
<th>Teach./Instr. Materials</th>
<th>Agents</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquire</td>
<td>Data</td>
<td>Tangible</td>
<td>Program/course content</td>
<td>Students</td>
<td>Investigate</td>
</tr>
<tr>
<td>Create</td>
<td>CH</td>
<td>Archaeological</td>
<td>Textbooks (any media)</td>
<td>Faculty members</td>
<td>Document</td>
</tr>
<tr>
<td>Arrange</td>
<td>Courses</td>
<td>Prehistorical</td>
<td>Syllabi</td>
<td>Academic advisors</td>
<td>Preserve</td>
</tr>
<tr>
<td>Describe</td>
<td>Information</td>
<td>Historical</td>
<td>Activities</td>
<td>Administrators</td>
<td>Manage</td>
</tr>
<tr>
<td>Preserve</td>
<td>Collections</td>
<td>Literary</td>
<td>Teaching methods</td>
<td>CH Institution</td>
<td>Visualize</td>
</tr>
<tr>
<td>Authenticate</td>
<td>Curriculum</td>
<td>Artistic</td>
<td>Learning Outcomes</td>
<td>University</td>
<td>Educate</td>
</tr>
<tr>
<td>Access</td>
<td>Knowledge</td>
<td>Scientific</td>
<td>Assessment</td>
<td>Financial stakeholders</td>
<td>Communicate</td>
</tr>
<tr>
<td>Process</td>
<td>Cultural</td>
<td>Intangible</td>
<td>Research areas</td>
<td>Legislators</td>
<td>Access</td>
</tr>
<tr>
<td>Distribute</td>
<td>Pedagogical</td>
<td>Oral</td>
<td>Performance</td>
<td>Dev./adv. staff</td>
<td>Assess</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Social practices</td>
<td>Donors</td>
<td>Plan</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Knowledge/practice nature</td>
<td>CH Professionals</td>
<td>Publicize</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Traditional craftsmanship</td>
<td>IS Professionals</td>
<td>Contextualize</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>General Public</td>
<td>Enjoy</td>
</tr>
</tbody>
</table>

CH = Cultural Heritage; IS = Information Systems

Figure 1. An ontological framework showing the intersection of the cultural heritage and education domains, dubbed the “Cultural Heritage and Curriculum Crosswalk.”
archives, including artistic, historical, and scientific manuscripts. The artistic and scientific elements consist only of artifacts, not documents. The historical element includes only property relating to history, historical figures, and historical events. An intangible cultural heritage, called oral, includes oral histories.

The elements in teaching and instructional materials are based on the literature in education and consultation with experts in the domain. Agents lists all the groups of people who could aid the collection-instruction integration and those who could benefit from it based on the literature and the personal experience of the authors. Lastly, outcomes are derived from the earlier work of Yaco and Ramaprasad17 and Yaco, Rizvi, and Ramaprasad.18 They are based on a review of literature and include the intended goals for all agents in connecting cultural heritage to curriculum. Some of the outcomes elements overlap, for instance educate and communicate, but are intended to describe the primary outcome of a pathway.

Mapping Literature onto an Ontological Framework

The ontology will be used to map the literature of a domain’s research. Some pathways appear frequently, some infrequently, and others not at all. The frequently instantiated and researched pathways are labeled “bright” themes, the infrequent ones “light” themes, and the overlooked ones “blank” themes.

This paper argues that the “luminosity” of each theme is a product of two opposing dynamics. A bright theme may be so because it is effective and important, for example, the study of description. On the other hand, it may also be a consequence of habit and herd behavior, irrespective of whether it is effective or important. A light theme may be so because it is ineffective, untimely, and unimportant, but lightness may also be a consequence of the difficulty of implementing or studying it, irrespective of its potential importance or effectiveness. A blank theme may have been simply overlooked by design or by accident; it may be infeasible and spuriously produced by the combination of the elements of the ontological framework.

Knowing the bright, light, and blank themes in practice and research will help develop more systemic and systematic approaches to the challenge of associating collections to curriculum. The following section will present a map of research in the problem domain in recent years, highlight the themes, and discuss possible reasons. Before presenting the results, the method used for selecting publications and for mapping will be discussed. In the conclusion, the potential implications of this program of research and the planned extensions to this paper will be presented.

Method

For this review, the authors selected relevant literature, coded the literature onto the ontological framework, and performed correlation analysis on the results.
Themes in Recent Research on Integrating Primary Source Collections and Instruction

Selection

To find relevant papers on the topic of connecting cultural heritage collections to higher education curricular elements, the authors searched literature in the fields of library science, archives, museums, computer science, education, and history. They browsed cultural heritage journals and bibliographies for sources and reviewed the footnotes and keywords of the material they found. The keywords were then used to search electronic databases and bibliographical utilities for archives, education, museum, education, and library serials including Library of Congress; Web of Science, a database of scientific citations; Scopus, a database of abstracts and citations from peer-reviewed journals; American Archivist, Archivaria, and Archival Science were searched individually using the keywords curriculum, syllabi, syllabus, and faculty.

An iterative process of defining and applying inclusion and exclusion criteria was used to extend searches, add sources, and remove sources. The broad inclusion criteria specified peer-reviewed literature published in English up to 2015. Excluded was literature that did not discuss curricular use of collections but instead focused on teaching research skills, such as information literacy and archival literacy. Studies that examined outreach to faculty or collaboration with faculty but did not mention collections and curriculum were also outside the scope of this study.

Ultimately, the selected body of literature contains 75 published works dating from 1982 to 2015, with the bulk of the papers from this century. (See Appendix B for a complete list of sources used in study). The literature describes techniques, strategies, and opinions on how practitioners have linked or could link collections to curriculum. Database indices for the papers listed 113 unique publisher or author-assigned keywords. Variants of information and library science, teaching or faculty, students, and history were the most frequent keywords. The corpus consisted of 42 journal articles, 30 book chapters, 1 book, 1 conference proceeding, and 1 thesis. The chapters were case studies selected from the book Past or Portal? Enhancing Undergraduate Learning through Special Collections and Archives. The articles came from 33 North American and 1 African journal. Except for History Teacher, the journals represented the fields of libraries, archives, and information management.

Table 1 shows the distribution of articles by journal, in descending order of frequency. Archival Issues: Journal of the Midwest Archives Conference, Journal of Academic Librarianship, and Reference & User Services Quarterly each had two articles in the study, and the other 28 journals had one article each.

Codification

Each publication was coded for all elements in the cultural heritage and curriculum crosswalk’s ontological framework. The coding was binary; each element was scored for whether it (or its synonym) was present or not present in the publication’s abstract, text...
Table 1.
Distribution of journal articles used in this study, by journal

<table>
<thead>
<tr>
<th>Journal name</th>
<th>Article count</th>
</tr>
</thead>
<tbody>
<tr>
<td>portal: Libraries and the Academy</td>
<td>3</td>
</tr>
<tr>
<td>RBM: A Journal of Rare Books, Manuscripts, and Cultural Heritage</td>
<td>3</td>
</tr>
<tr>
<td>History Teacher</td>
<td>3</td>
</tr>
<tr>
<td>Archival Issues: Journal of the Midwest Archives Conference</td>
<td>3</td>
</tr>
<tr>
<td>Journal of Academic Librarianship</td>
<td>2</td>
</tr>
<tr>
<td>Reference &amp; User Services Quarterly</td>
<td>2</td>
</tr>
<tr>
<td>African Journal of Library, Archives and Information Science</td>
<td>1</td>
</tr>
<tr>
<td>Archivaria</td>
<td>1</td>
</tr>
<tr>
<td>Art Documentation: Bulletin of the Art Libraries Society of North America</td>
<td>1</td>
</tr>
<tr>
<td>Art Libraries Journal</td>
<td>1</td>
</tr>
<tr>
<td>Collection Building</td>
<td>1</td>
</tr>
<tr>
<td>Collection Management</td>
<td>1</td>
</tr>
<tr>
<td>College &amp; Research Libraries</td>
<td>1</td>
</tr>
<tr>
<td>College &amp; Research Libraries News</td>
<td>1</td>
</tr>
<tr>
<td>College &amp; Undergraduate Libraries</td>
<td>1</td>
</tr>
<tr>
<td>Historical Journal of Massachusetts</td>
<td>1</td>
</tr>
<tr>
<td>Information Technology and Libraries</td>
<td>1</td>
</tr>
<tr>
<td>Journal for the Society of North Carolina Archivists</td>
<td>1</td>
</tr>
<tr>
<td>Journal of Archival Organization</td>
<td>1</td>
</tr>
<tr>
<td>Journal of Business &amp; Finance Librarianship</td>
<td>1</td>
</tr>
<tr>
<td>Journal of Library &amp; Information Services in Distance Learning</td>
<td>1</td>
</tr>
<tr>
<td>Journal of Library Administration</td>
<td>1</td>
</tr>
<tr>
<td>Journal of the Medical Library Association</td>
<td>1</td>
</tr>
<tr>
<td>Library Review</td>
<td>1</td>
</tr>
<tr>
<td>Midwestern Archivist</td>
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<tr>
<td>Public Services Quarterly</td>
<td>1</td>
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<tr>
<td>Rare Books and Manuscript Librarianship</td>
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<td>Research Library Issues</td>
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<tr>
<td>American Archivist</td>
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</tr>
<tr>
<td>Journal of Academic Librarianship</td>
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<tr>
<td>Reference Librarian</td>
<td>1</td>
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<tr>
<td>Theological Librarianship</td>
<td>1</td>
</tr>
<tr>
<td>Urban Library Journal</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total journal articles</strong></td>
<td><strong>42</strong></td>
</tr>
</tbody>
</table>
Analysis

The data were analyzed to generate (1) the frequency of occurrence of each element (monad) in the ontological framework, and (2) the co-occurrence of elements in the ontology in the pathways, using cluster analysis. The analysis was intended to visually summarize the data about the corpus or population of papers, not to make statistical inferences about the population from a sample of papers.

The clusters were formed based on the coding similarity between pairs of ontology elements in the corpus measured by the simple matching coefficient, a statistic used for comparing the similarity and diversity of sample sets, and by single-linkage (nearest-neighbor) clustering, which defines the similarity between clusters as the shortest distance from any object in one cluster to any object in the other. The simple matching coefficient is a symmetric similarity measure that considers presence and absence of elements in the articles equally. In contrast, other binary similarity or distance measures, such as those developed by Paul Jaccard and Lee Dice, only consider presence of elements. In ontological analysis, both presence and absence of elements convey equally important information.

The following sections present the results of the frequency analysis and cluster analysis. Subsequently, the results and limitations of the study are discussed. Last, the article will conclude with a summary of findings and plans for extending the research.

Results

Frequency Analysis

The frequency of individual elements for all 75 articles is shown in Figure 2. The numbers in columns adjacent to the element names are the frequency percentage of their occurrence in the corpus of 75 articles.

Frequency analysis depicts each element in isolation, not in association with the other elements. It is more likely that the higher frequency elements across the dimensions co-occur in the corpus. Hence, one may infer co-occurrences from the frequency analysis. However, cluster analysis of the frequency data can help visualize the associations exactly. The following section describes how.

Cluster Analysis

The clusters, or themes, are mapped onto the ontology in Figure 3. The elements are shaded from white to dark gray representing the primary, secondary, tertiary, quaternary, and quinary themes. The first two represent the dominant themes of the corpus—the bright themes. The next two are nondominant themes—the light themes. The last is really a non-theme rather than a theme, accenting what is virtually absent from the corpus—the
<table>
<thead>
<tr>
<th>Figure</th>
<th>#</th>
<th>Semiotics</th>
<th>Cultural Heritage</th>
<th>#</th>
<th>Teaching/Instructional Materials</th>
<th>#</th>
<th>Agents</th>
<th>#</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create</td>
<td>51</td>
<td>Data-CH</td>
<td>58 Tangible-Literacy</td>
<td>74</td>
<td>Research areas</td>
<td>45</td>
<td>Students</td>
<td>62</td>
<td>Investigate</td>
</tr>
<tr>
<td>Describe</td>
<td>46</td>
<td>Data-Courses</td>
<td>43 Tangible-Artistic</td>
<td>14</td>
<td>Activities</td>
<td>45</td>
<td>Faculty members</td>
<td>56</td>
<td>Educate</td>
</tr>
<tr>
<td>Access</td>
<td>36</td>
<td>Information-Collections</td>
<td>24 Intangible-Oral</td>
<td>5</td>
<td>Teaching methods</td>
<td>31</td>
<td>CH Professionals</td>
<td>47</td>
<td>Contextualize</td>
</tr>
<tr>
<td>Distribute</td>
<td>13</td>
<td>Knowledge-Pedagogical</td>
<td>13 Tangible-Scientific</td>
<td>4</td>
<td>Syllabi</td>
<td>16</td>
<td>General Public</td>
<td>8</td>
<td>Publicize</td>
</tr>
<tr>
<td>Acquire</td>
<td>10</td>
<td>Information-Curriculum</td>
<td>10 Tangible-Archaeological</td>
<td>2</td>
<td>Learning Outcomes</td>
<td>4</td>
<td>Administrators-CH Institution</td>
<td>4</td>
<td>Access</td>
</tr>
<tr>
<td>Preserve</td>
<td>6</td>
<td>Knowledge-Cultural</td>
<td>10 Tangible-Prehistorical</td>
<td>1</td>
<td>Textbooks</td>
<td>4</td>
<td>Administrators-University</td>
<td>1</td>
<td>Plan</td>
</tr>
<tr>
<td>Process</td>
<td>6</td>
<td>Knowledge-Cultural</td>
<td>10 Tangible-Historical</td>
<td>0</td>
<td>Assessment</td>
<td>0</td>
<td>Academic advisors</td>
<td>0</td>
<td>Manage</td>
</tr>
<tr>
<td>Arrange</td>
<td>3</td>
<td>Intangible-Performance</td>
<td>0</td>
<td>Financial stakeholders-Legislators</td>
<td>0</td>
<td>Enjoy</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Authenticate</td>
<td>2</td>
<td>Intangible-Social practices</td>
<td>0</td>
<td>Financial stakeholders-Dev./adv. staff</td>
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<td>Communicate</td>
<td>7</td>
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<tr>
<td></td>
<td></td>
<td>Intangible-Knowledge/practice nature</td>
<td>0</td>
<td>Financial stakeholders-Donors</td>
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<td>Document</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Intangible-Traditional craftsmanship</td>
<td>0</td>
<td>IS Professionals</td>
<td>0</td>
<td>Preserve</td>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 2. The frequency of individual elements within all 75 articles. The numbers in columns adjacent to the element names are the frequency percentage of their occurrence in the articles.
Themes in Recent Research on Integrating Primary Source Collections and Instruction

blank themes. The last category includes many potential themes that are or could be critical for cultural heritage informatics but are absent. The following section discusses the themes and non-themes inferred from the ontological map and cluster analysis. The next section covers the results and limitations of the study.

The primary theme encompasses all the dimensions of the ontology. It is a system to create and access data about cultural heritage and courses to match tangible literary collections and activities and research areas of students and faculty members. This theme describes such works as Doris Malkmus’s article “Old Stuff for New Teaching Methods: Outreach to History Faculty Teaching with Primary Sources.” The secondary theme, however, is segmented; it covers only some of the dimensions of the ontology. This theme depicts collections and teaching methods to aid cultural heritage professionals to contextualize cultural heritage. No semiotics or types of cultural heritage collections are included in the secondary theme. Peterson Brink, Mary Ellen Ducey, Andrew Jewell, and Douglas Seefeldt’s book chapter “University of Nebraska-Lincoln: Teaching Digital History through the University Archives: The Case of Nebraska U: A Collaborative History” is represented by this theme. The tertiary theme, too, is segmented. It is comprised of information collections and syllabi to access and publicize cultural heritage, which is covered in Valerie Knight and Charissa Loftis’s article “Moving from Introverted to Extraverted Embedded Librarian Services: An Example of a Proactive Model.”

The quaternary theme excludes only the teaching and instructional materials dimension. It represents a system to acquire and distribute cultural information and cultural and pedagogical knowledge about tangible artistic collections to help the public manage, communicate, plan, and enjoy cultural heritage. Elizabeth Downey’s article “Graphic Novels in Curriculum and Instruction Collections” fits this theme.

The themes can also be used to analyze individual and pairs of dimensions, which will be illustrated with examples from the corpus. The primary theme for agents and outcomes in the surveyed literature selectively focuses on the investigation and education of cultural heritage by students and faculty members. Among the 51 papers with this theme are Kate Theimer’s book Educational Programs: Innovative Practices for Archives and Special Collections and Jason Tomberlin and Matthew Turi’s article “Supporting Student Work: Some Thoughts about Special Collections Instruction.” The corpus secondarily focuses on helping cultural heritage professionals contextualize cultural heritage, in such articles as Michael Casey and Michael Flannery’s “Utilizing the Past in the Present Curriculum: Historical Collections and Anatomy at the University of Alabama School of Medicine.” There is a tertiary emphasis on access and publicity of cultural heritage, as discussed in Kelly Miller and Robert D. Montoya’s article “Teaching and Learning Los Angeles through Engagement with UCLA Library Special Collections.” Susannah Waters’s “Historical Resources and Creative Education at Glasgow School of Art” is one of the few papers in the quaternary focus, that is, management, communication, planning, and enjoyment of cultural heritage. There is no thematic focus on the many other agents and outcomes.

The primary theme selectively focuses on matching collections to activities and research areas to aid the desired outcomes by the agents. Matthew Cook’s article “Build It and They Will Come: Integrating Unique Collections and Undergraduate Research” is one example of this focus. The secondary theme’s focus is on teaching methods, as in
Barbara Rockenbach’s “Archives, Undergraduates, and Inquiry-Based Learning: Case Studies from Yale University Library.”36 Syllabi, discussed in Cindy Shirkey’s “Taking the Guesswork out of Collection Development: Using Syllabi for a User-Centered Collection Development Method.”37 is the tertiary theme’s focus.

For cultural heritage artifacts, the primary theme’s focus is on tangible literary artifacts, and the tertiary theme’s focus is on tangible artistic artifacts, the later solely represented in the corpus by Steve Lawson and Jessy Randall’s book chapter “Colorado College: Case Study: The History and Future of the Book, a Half-Block Course at Colorado College.”38 There is no thematic focus on the other types of cultural heritage artifacts in the themes. The themes cover all the elements of semiotics with different emphases. The primary theme’s focus is on data about cultural heritage and courses, such as George Thomas Kapelos and Susan Patrick’s article “Teaching with the Canadian Architect Fonds: A Collaboration between Ryerson University Librarians and Instructors in Architecture Using Special Collections.”39 There is no secondary theme for the semiotics dimension, but the tertiary theme’s focus is on information about collections. Christine Borgman, Gregory Leazer, A. J. Gilliland-Swetland, Kelli Millwood, Leslie Champeny, Jason Finley, and Laura Smart’s presentation “How Geography Professors Select Materials for Classroom Lectures: Implications for the Design of Digital Libraries” is an example of the quaternary theme’s focus on information about curriculum and cultural and pedagogical knowledge.40

The thematic focus on the functions, too, is selective. The primary theme’s focus is selectively on creating and accessing data, information, and knowledge. The secondary theme’s focus is on describing them, and the quaternary theme’s is on acquiring and distributing them. The quinary cluster has many absent themes. Gwenn Lochstet’s article “Course and Research Analysis Using a Coded Classification”41 is one of many examples of the focus of the function primary theme.

Having identified the themes of each dimension and the ontology as a whole, the bright, light, and blank themes in the research will be highlighted and possible reasons and implications discussed.

**Discussion and Limitations**

The cluster analysis identifies the bright themes (frequently researched pathways) for integrating cultural heritage artifacts and curriculum—that is, systems that create, access, and describe cultural heritage artifacts and course data to match literary collections to classroom activities, research areas, and teaching methods. Doing so can help students to investigate and faculty to educate about cultural heritage. While these complex, bright pathways include all the dimensions in the ontology, the results may be better understood if broken into subsets of dimensions.

Functions and semiotics pathways show how data in systems that match collections to curriculum are manipulated. The bright pathways are creating, accessing, and describing cultural heritage and curriculum data. Acquiring and distributing cultural heritage and curriculum information and knowledge are lightly discussed in the literature. Semiotics has no blank spots, but underrepresented functions include arranging, preserving, authenticating, and processing. Several of these have potential for helping
Figure 3. A visualization of clusters or themes within publications. The shading from white to dark gray represents the primary, secondary, tertiary, quaternary, and quinary themes. The first two are the dominant themes, the bright themes. The next two are nondominant themes, the light themes. The last is a non-theme, highlighting what is virtually absent from the corpus—the blank themes.
to get more collections into the curriculum. For instance, authenticating cultural heritage data makes them more trustworthy to use in classrooms.

The bright spot in cultural heritage research in this corpus is overwhelmingly that of tangible literary artifacts, which make up most of the holdings of archives. There is light emphasis on tangible artistic cultural heritage. The lack of research emphasis on the intangible cultural heritage elements is a blank gap, reflecting the physical nature of archives, libraries, and museums. Another blank gap is tangible-historical, since it consists of a type of cultural heritage seldom found in repositories—real estate property. The dearth of emphasis on archeological and prehistoric tangible cultural heritage and intangible oral cultural heritage in this corpus has no structural reason and can be considered an overlooked spot. There may genuinely be little research in this area, or it may be that search terms special collections, archives, libraries, and museums unintentionally excluded relevant investigations. Adding searches on each type of cultural heritage artifact may have filled this blank spot in the corpus.

In teaching and instructional materials, the bright spots are using classroom activities, research areas, and teaching methods to match to collections. Lightly covered in the corpus is the use of syllabi as a matching tool, even though syllabi provide a wealth of information about course content. Textbooks, learning outcomes, and assessment are overlooked themes in the literature, each of which has rich potential to provide multiple links to cultural heritage collections. Yaco, Caroline Brown, and Lee Konrad extrapolated subject terms from course textbooks onto classes, which were used to link to subject terms in manuscript collection. Leslin Charles and others use learning outcomes to map information literacy to classes. As might be expected, the heavily researched themes for agents and outcomes in the surveyed literature are students, faculty members, and cultural heritage professionals investigating, educating, and contextualizing cultural heritage. Lightly researched are access, publicity, management, communication, planning, and enjoyment of cultural heritage. The blank areas include academic advisers, administrators, financial stakeholders, information systems professionals, and the outcomes of documenting, preserving, visualizing, and assessing cultural heritage. While the principal outcome of instruction is to investigate and educate, the longevity of cultural heritage largely depends on multiple stakeholders’ abilities to enjoy, communicate, and preserve these resources.

Examining overlooked elements in all the dimensions reveals a number of fruitful practices and research areas. For instance, describing pedagogical knowledge to find ways to connect oral history collections with learning outcomes could help donors to document cultural heritage. Talking about teaching methods that librarians and teaching faculty can use with oral histories to meet learning outcomes could make development and advancement staff more willing to ask donors to fund the documentation of cultural heritage. Similarly authenticating cultural heritage data could help the public to preserve these data by making them value real primary sources. Acquiring cultural heritage artifacts to match to teaching and learning materials is a light spot in this corpus but a common practice in the library world and presents an opportunity for expanding collections. Another light spot, organizing and arranging information about collections to link them to research areas, could provide more paths into material. Linking cultural heritage literary collections to learning assessments could help academic advisers to communicate about cultural heritage to students.
Implications for Instruction

The mapping of articles onto the ontology presents bright, light, and blank spots for the literature, providing insights on methods commonly used to link courses and collections. While the literature was largely produced by the world of archives, the themes could also apply to librarians and other cultural heritage professionals. For instance, the theme “create, access, and describe data about cultural heritage artifacts and courses” translates into creating catalog records for materials and course descriptions and accessing and describing the data in LibGuides, commonly used to promote sources for specific courses. Librarians and educators regularly match collections to classroom activities and research areas through orientation sessions, embedded librarianship, liaison programs, and one-on-one reference assistance. Museum and gallery professionals in academic settings use exhibits and programming to help students investigate, and faculty to educate about, cultural heritage.

A practical application of the ontology for librarians, curators, and instructors is to map how (using functions, semiotics, and teaching and learning materials) and why (with agents and outcomes) they currently integrate primary sources with curriculum. This could reveal a broad range of possibilities. If the mapping does not mirror the patterns found in the literature, perhaps those themes could be tried. If present methods are not effective, the practitioners could explore their own light and blank themes. For instance, they could try examining course textbooks to find collections that have similar topics or targeting courses with program assessments that stress the need for more undergraduate research.

The ontology can be used in tandem with the Association of College and Research Libraries 2016 “Framework for Information Literacy for Higher Education.”44 One place that these two frameworks meet is the frame “Information Creation as Process.” The ontology presents a systematic view of the behaviors of cultural heritage professionals in working with artifacts (functions), in various aspects of education (teaching and instructional materials), by and for whom (agents), and for what ends (outcomes). Students can apply their understanding of this system to future work within their discipline and to lifelong learning.

Limitations

The results are based on the population of articles on the intersection of education and cultural heritage from electronic databases and trade journals. The search criteria may have missed relevant research and hence excluded it from coding.

The reviewers used the ontological framework glossary to guide their coding, and the coders tried to stay true to the text of the abstracts or chapters without imputing their own expectations. Nonetheless, their dissimilar professional backgrounds led the reviewers to interpret the definitions and articles differently. One cannot exclude the possibility of over-coding and under-coding, particularly for domains outside the expertise of each coder. For example, the educator coded fewer publications as access (an element in the functions dimension) than did the archivist but classified more as teaching methods and learning outcomes (elements in the teaching and instructional materials dimension). Each coder appeared to have a reduced ability to recognize syn-
onyms of elements outside his or her own discipline. The challenges of communicating interactions across domains prompted the creation of the crosswalk, so this realization is particularly important.

Future research could map a broader universe of literature onto the ontology. More robust selection criteria could include each element of the cultural heritage dimension. Whereas the current study was limited to curricular use of cultural heritage artifacts in higher education, primary and secondary education levels could be included, as could the use of information literacy instruction by cultural heritage repositories. Other research directions could include utilizing the flexibility of the ontology to add a subdimension for Benjamin Bloom’s taxonomy of educational objectives, a classification system used to arrange learning objectives into levels of complexity.45 While the current study has discussed reasons for some themes, future research could more extensively probe the antecedent reasons for the bright, light, and blank themes.

**Conclusion**

This study presents an ontological framework that succinctly describes the main techniques used by cultural heritage professionals to link cultural heritage artifacts to curriculum. The ontology provides a way to map current research onto the intersection of libraries, archives, and museums with curriculum. Using cluster analysis, correlations within the mapping can be analyzed to identify research emphases and gaps. The roads that librarians, archivists, and teaching faculty travel heavily, lightly, or barely, if at all, can be seen.

How do professionals in cultural heritage and education integrate cultural heritage artifacts with curriculum? Primarily, they create, access, and describe data about cultural heritage artifacts and courses to match collections to classroom activities and research areas to help students and faculty learn and educate. They match collections to teaching and instructional materials by using classroom activities, research areas, and teaching methods. These pairings primarily help students, faculty members, and cultural heritage professionals investigate, educate, and contextualize cultural heritage.

What is the road less traveled? Or to put it another way, which roads could be utilized more? Arranging, preserving, authenticating, and processing could all be used to manipulate data, information, and knowledge to help match cultural heritage and curriculum. To find similar context, textbooks, learning outcomes, and program and course assessment could be examined and compared to collections. Academic advisers, administrators, financial stakeholders, and information systems professionals could benefit from pulling cultural heritage into classrooms. Donors want to see that their collections have a practical use in a range of disciplines. The goals of documenting, preserving, visualizing, and assessing cultural heritage are vital to the future of education and cultural heritage. The development of robust analysis provided by this ontology or future versions will be crucial tools to achieve these goals.

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Appendix A

Glossary (Definitions, by Dimension)

**Crosswalk:** “The relationships between the elements of two or more data structures . . . A chart or diagram that indicates the correspondence between two systems.”46

**Function: The Functions of the System**

**Access:** To provide access to or retrieve data/information/knowledge about cultural heritage and curriculum.

**Acquire:** To acquire or collect data/information/knowledge about cultural heritage and curriculum.

**Arrange:** To arrange or organize data/information/knowledge about cultural heritage and curriculum.

**Authenticate:** To authenticate or secure data/information/knowledge about cultural heritage and curriculum.

**Create:** To create, edit, or delete data/information/knowledge about cultural heritage and curriculum.

**Describe:** To describe, index, or represent data/information/knowledge about cultural heritage and curriculum.

**Distribute:** To distribute data/information/knowledge about cultural heritage and curriculum.

**Preserve:** To preserve, store or sustain data/information/knowledge about cultural heritage and curriculum.

**Process:** To process data/information/knowledge about cultural heritage and curriculum.

**Semiotics:** Symbolic Representations of Cultural Heritage and Curriculum at Different Levels of Abstraction

**Data:** Measurements and Observations, Qualitative and Quantitative, about Cultural Heritage and Curriculum

**Courses:** Data about courses.

**Cultural heritage:** Data about cultural heritage.
Information: Relationships among the Data about Cultural Heritage and Curriculum

Collections: Information about collections of cultural heritage.
Curriculum: Information about the curriculum.

Knowledge: Interpretations of the Relationships among the Cultural Heritage and Curriculum Data

Culture: Knowledge about culture.
Pedagogy: Knowledge about the pedagogy of the curriculum.

Cultural Heritage: Artifacts and Heritage of a Culture

Tangible: Tangible Cultural Heritage Artifacts

Archaeological: “Products of archaeological excavations (including regular and clandestine) or of archaeological discoveries.”

Artistic: “Pictures, paintings and drawings produced entirely by hand on any support and in any material (excluding industrial designs and manufactured articles decorated by hand); original works of statuary art and sculpture in any material; original engravings, prints and lithographs; original artistic assemblages and montages in any material.”

Historical: “Property relating to history, including the history of science and technology and military and social history, to the life of national leaders, thinkers, scientists and artist and to events of national importance.”

Literary: “Rare manuscripts and incunabula, old books, documents and publications of special interest (historical, artistic, scientific, literary, etc.) singly or in collections.”

Prehistorical: Property predating history such as prehistorical tools, structures, paintings, etc.

Scientific: Scientific and technological objects, instruments, devices, etc. significant to the advancement of science and technology.

Intangible: Intangible Cultural Heritage

Knowledge/practice nature: Knowledge and practices concerning nature and the universe.
Oral: Oral traditions and expressions, including language as a vehicle of the intangible cultural heritage.
Performance: Performing arts.
Social practices: Social practices, rituals and festive events.

Teaching and Instructional Materials: “Print or Nonprint Materials Used in Instruction”

Program and Course Content

Activities: Projects and assignments used to educate as part of the curriculum.
Syllabi: A description of the structure and content of the courses in the curriculum.
Teaching methods: The method of teaching the programs or courses.
Themes in Recent Research on Integrating Primary Source Collections and Instruction

Textbooks (any media): Physical or digital media (including books, audio videos, articles, and maps) embodying the common body of knowledge regarding the subject of the programs or courses.

Learning Outcomes: Desired outcomes for students at various levels (module, course, program, department, etc.)

Assessment: The assessment of the teaching and learning at various levels

Research Areas: Subject of research by faculty, students, or others

Agents: The Agents to Obtain the Various Outcomes regarding Cultural Heritage

Academic advisers: The academic advisers to students and faculty members.
Administrators: The administrators of cultural heritage outcomes.
Cultural heritage institution: The administrators of cultural heritage institutions (library, archives, and museums) and the outcomes.
Cultural heritage professionals: The cultural heritage professionals responsible for the outcomes.
Development /Advancement staff: The development and advancement staff members raising funds for the cultural heritage and outcomes.
Donors: The donors to programs in cultural heritage and outcomes.
Faculty members: The faculty members of cultural heritage.
Financial stakeholders: The financial stakeholders in the cultural heritage and outcomes.
General public: The public at large.
IS professionals: The information systems professionals responsible for the system and its outcomes.
Legislators: The legislators involved in funding the cultural heritage and outcomes.
Students: The students of cultural heritage.
University: The university administrators of cultural heritage and the outcomes.
Outcome: The Outcomes of Integrating Cultural Heritage into the Curriculum

Access: To access cultural heritage.

Assess: To assess cultural heritage.
Communicate: To communicate cultural heritage.
Contextualize: To contextualize cultural heritage.
Document: To document cultural heritage.
Educate: To educate about cultural heritage.
Enjoy: To enjoy cultural heritage.
Investigate: To investigate cultural heritage.
Manage: To manage cultural heritage.
Plan: To plan cultural heritage.
Preserve: To preserve cultural heritage.
Publicize: To publicize cultural heritage.
Visualize: To visualize cultural heritage.
Appendix B

Publications on Curricular Use of Cultural Heritage Collections


Brink, Peterson, Mary Ellen Ducey, Andrew Jewell, and Douglas Seefeldt. “University of Nebraska-Lincoln: Teaching Digital History through the University Archives: The Case of Nebraska U: A Collaborative History.” In Mitchell, Seiden, and Taraba, *Past or Portal?*


Chase, Elizabeth A. “Emory University: Teaching First-Year Writing with ‘All the Detritus, Debris and Ephemera’ of Literary Manuscripts.” In Mitchell, Seiden, and Taraba, Past or Portal?


Dean, Gabrielle. “Johns Hopkins University: Teaching by the Book: The Culture of Reading in the George Peabody Library.” In Mitchell, Seiden, and Taraba, Past or Portal?


Grob, Julie. “University of Houston: More Than Gold Leaf: Teaching Undergraduates in Capstone Courses about the Scholarly Use of Medieval Manuscripts.” In Mitchell, Seiden, and Taraba, Past or Portal?
Hansen, Marianne. “Bryn Mawr College: Real Objects, Real Spaces, and Real Expertise: An Undergraduate Seminar Curates an Exhibition on the Medieval Book of Hours.” In Mitchell, Seiden, and Taraba, Past or Portal?

Harter, Christopher. “Tulane University: Amistad Research Center Case Study.” In Mitchell, Seiden, and Taraba, Past or Portal?

Havens, Earle. “Johns Hopkins University: The Scholars’ Bookshelf: Recreating a Pre-modern Library for the Classroom.” In Mitchell, Seiden, and Taraba, Past or Portal?


Johnson, Eric J. “The Ohio State University: Seeing through the ‘Priest’s Eye’: Teaching Medieval Codicology and Book History through William of Pagula’s Oculus sacerdotis.” In Mitchell, Seiden, and Taraba, Past or Portal?


Lane, Anne Marie. “University of Wyoming, Laramie: Books in History; Books AS History: Teaching Undergraduates in the Toppan Rare Books Library, University of Wyoming.” In Mitchell, Seiden, and Taraba, Past or Portal?

Lawson, Steve, and Jessy Randall. “Colorado College: Case Study: The History and Future of the Book, a Half-Block Course at Colorado College.” In Mitchell, Seiden, and Taraba, Past or Portal?

Legge, L. K. Gypsy, Matthew Reynolds, and Dale Sauter. “East Carolina University: Rebooting the Old North State: Connecting Undergraduates with State Focused Special Collections Materials.” In Mitchell, Seiden, and Taraba, Past or Portal?

Levine, Victoria Lindsay. “Colorado College: Archival Sound Recordings in Undergraduate Education: The Rubén Cobos Collection of Indo-Hispanic Folklore.” In Mitchell, Seiden, and Taraba, Past or Portal?


Losoff, Barbara, Caroline Sinkinson, and Elizabeth Newsom. “University of Colorado, Boulder: Special Collections Instruction in the Sciences: A Collaborative Model.” In Mitchell, Seiden, and Taraba, 


Mulder, Megan, and Carolyn Jones. “Wake Forest University: Putting the Material in Materiality: The Embedded Special Collections Librarian.” In Mitchell, Seiden, and Taraba, Past or Portal?


Rineer, Carla Mary, and Marilyn McKinley Parrish. “Millersville University: Engaging the Text.” In Mitchell, Seiden, and Taraba, Past or Portal?


———. “Wesleyan University: Where Do We Go from Here? Evaluating a Long-Term Program of Outreach and Making It Better.” In Mitchell, Seiden, and Taraba, Past or Portal?


Walworth, Julia. “Merton College, Oxford University: ‘Speed-Dating’ in Special Collections: A Case Study.” In Mitchell, Seiden, and Taraba, Past or Portal?


Notes


9. Yaco, Rizvi, and Ramaprasad, “Cultural Heritage Curriculum Crosswalk.”


18. Yaco, Rizvi, and Ramaprasad, “Cultural Heritage Curriculum Crosswalk.”


27. Peterson Brink, Mary Ellen Ducey, Andrew Jewell, and Douglas Seefeldt, “University of Nebraska-Lincoln: Teaching Digital History through the University Archives: The Case of Nebraska U: A Collaborative History,” in Mitchell, Seiden, and Taraba, Past or Portal?


32. Steve Lawson and Jessy Randall, “Colorado College: The History and Future of the Book, a Half-Block Course at Colorado College,” in Mitchell, Seiden, and Taraba, Past or Portal?


42. Yaco, Brown, and Konrad, “Linking Special Collections to Classrooms.”


48. Ibid.

49. Ibid.

50. Ibid.