

Mapping current practices and future possibilities for integrating primary sources into higher education curriculum using the Culture Heritage to Curriculum Crosswalk Ontology

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Abstract:

How do cultural heritage professionals and higher education faculty connect their collections to curriculum? Are there ways to increase the utilization of primary sources by students? An ontological framework can help to visualize the complex intersection of the two domains – cultural heritage and curriculum. To understand how current practices fit into that picture, literature from library science, education, and computer science is mapped onto an ontology. The mapping reveals emphases and gaps in current research and practice: the most common practice is matching cultural heritage data to faculty members to help archivists and librarians to educate students. The Culture Heritage to Curriculum Crosswalk Ontology shows 16,848 possible ways to find courses to use our rich resources and find collections that meet university curricular needs. While some of those combinations are impractical, many represent new access points for furthering the educational missions of all academic stakeholders. One of the least common practices, that should be explored, is correlating course content to collections to provide academic advisers opportunities for students to study cultural history.

Introduction and problem statement

Libraries, museums, and archives do outreach, plan programs, create course-specific research guides, and meet with teachers and faculty in order to integrate primary sources into curriculum. Despite these efforts, cultural heritage collections are underused in education. Logistical, financial, and regulatory roadblocks could explain why K-12 lesson plans do not include archives. These barriers are lower at colleges and universities, which often have on-site repositories with professional archivists and faculty who have used primary sources in their own research. Why then do so few classes use primary source collections at colleges and universities? To begin to answer that question, we will need to understand how cultural heritage professionals working in academia currently try to integrate collections into courses. Describing current practice can provide a basis for identifying techniques we may be overusing. A thorough depiction of how we find courses that could use our holdings could also show what techniques we are overlooking. Are we relying on data about our holdings and seldom using faculty research areas to interest faculty in including our collections in their courses? Are we only connecting to class activities and never course objectives?

The objectives of this study are to: (a) systematically map research and the practice of connecting collections and curriculum, (b) use the mapping to analyze research and practice, and (c) identify gaps in research and practice. Research literature, which reflects practice, will be mapped onto an ontology. The ontology was developed by Sonia Yaco, Arkalgud Ramaprasad, and Saleha Rizvi to describe the crosswalk¹ or relationship between the domains of cultural heritage and curriculum. Yaco et. al dubbed the structure the Cultural Heritage and Curriculum Crosswalk Ontology.² Outreach, instruction and other literature related to collections from both

¹ See Appendix A: Glossary.

² For a fuller discussion of the ontology see:

Yaco, Sonia, Saleha Rizvi, and Arkalgud Ramaprasad, "Cultural Heritage Curriculum Crosswalk: Using metadata to connect to curriculum," in *Organization, Representation, and Description through the Digital Age: Information in Libraries, Archives, and Museums*. De Gruyter Saur (February 2018).

domains will be mapped. Research on collections-based library instruction is included, but outreach for skill-based instruction is outside of the purview of this paper. For instance, case studies of information literacy initiatives that have no connection to collection content are excluded, but studies of techniques for general orientation about manuscript holdings are included.

Methodology

This review is a scoping study, so named because it studies the scope of literature. A scoping study is, “a technique to 'map' relevant literature in the field of interest.”³ Scoping studies can be used, “to identify research gaps in the existing literature... drawing conclusions regarding the overall state of research activity.”⁴ Literature relevant to the research question was selected, coded, and mapped onto the Cultural Heritage and Curriculum Crosswalk Ontology.

Research question

How and why do cultural heritage professionals - particularly archivists - match primary source collections to university curriculum?

Identification and selection of literature

An iterative process of fine-tuning inclusion and exclusion criteria was used to search for, add and remove literature. Relevant sources were found by searching electronic databases, browsing cultural heritage journals, reviewing bibliographies, and harvesting references from footnotes of found material. The initial inclusion criteria:

- Peer-reviewed literature published in English through 2015 and
- Related to any aspect of connecting curricular elements to cultural heritage in higher education.

Exclusion criteria:

- The foci of this study are on the practices of higher education and academic libraries so literature that only discusses primary schools, secondary schools, and public libraries was excluded.
- The research interest is connecting holdings to course content, so literature about general outreach to faculty and students that does not specifically discuss collections was excluded. Likewise, articles on curriculum for graduate library schools that does not pertain to linking collections to courses were also removed.
- The study addresses linking course content to collection content, so literature on research skills, such as information literacy and archival literacy, without reference to collections was removed.

Cultural Heritage and Curriculum Crosswalk Ontology

The framework used for mapping the selected body of literature is the Cultural Heritage and Curriculum Crosswalk Ontology. For the sake of brevity, a condensed version of the ontology is used in this paper and represented in Tables 1 – 3. The ontology structure is flexible enough to be expanded and contracted for different purposes and audiences. The ontology describes the methods, stakeholders, and goals of connecting cultural heritage and curriculum using dimensions (columns) and elements (rows) (See Table 1). (Note: We will capitalize the words that refer to the dimensions and elements in the ontology, except in narrative descriptions of full or partial components). The dimensions consist of Functions, Semiotics⁵, Curriculum, Agents, and Outcomes (See

³ Hilary Arksey and Linda O'Malley, “Scoping Studies: Towards a Methodological Framework,” *International Journal of Social Research Methodology* 8, no. 1 (2005): 20. doi:10.1080/1364557032000119616.

⁴ Arksey and O'Malley, “Scoping Studies”, 22.

⁵ “Semiotics describes the process by which stimuli are transformed into information and information is transformed into stimuli; in other words, it is the process by which information is generated and dissipated.” Arkalgud Ramaprasad and A. Rai, “Envisioning management of information,” *Omega-International Journal of Management Science* 24 (1996): 187.

Appendix A Glossary). Functions are listed in the order that they usually occur in information systems and include a mix of information system and traditional archival functions. Semiotics consists of Cultural Heritage⁶ and Curriculum data, information, and knowledge. Agents are listed roughly by involvement in curricular activities and elements in other dimensions are listed in no particular order.

Cultural Heritage and Curriculum Crosswalk: A Condensed Ontology						
	Functions	Semiotics (Data, Information, Knowledge)	Curriculum	Agents	Outcomes	
[A system to]	Acquire/Collect	[+] Cultural Heritage	[data/info/knowledge to match collections &] Syllabi	[to aid] Students	[to] Investigate	[cultural heritage]
	Create/Edit/Delete	Curriculum	Content	Faculty Members	Document	
	Organize/Arrange		Textbooks	CH Professionals	Preserve	
	Index/Describe/Represent		Learning Outcomes	IT Professionals	Manage	
	Store/Preserve/Sustain		Faculty	Administrators--CH Institution	Visualize	
	Secure/Authenticate		Students	Administrators--University	Educate	
	Retrieve		Pedagogy	Academic Advisors	Communicate	
	Process		Assessment	Financial Stakeholders	Access	
	Distribute			General Public	Assess	
					Plan	
				Publicize		
				Contextualize		
				Enjoy		

Table 1. An ontology to describe the Cultural Heritage (CH) and Curriculum Crosswalk.

The dimensions of the ontology are arranged left to right with adjacent words/connectors such that the concatenation of an element from each dimension with the adjacent words/connectors creates a natural English sentence illustrating a potential component of the Crosswalk. The five dimensions have a total of 41 elements, allowing for 16,848 possible components. The components define the Crosswalk. A “system” could refer to a project, process, or computer program. As an example, an archivist may have a project to describe a set of collections to better link them to learning outcomes so that university administrators can put cultural heritage in context. This project could be mapped onto the ontology to become the component:

[A system to] index/describe/represent [+] Cultural heritage [data/info/knowledge to match collections, etc.] Learning outcomes [to aid] Financial stakeholders [to] Contextualize [cultural heritage]. (See Table 2).

Cultural Heritage and Curriculum Crosswalk: A Condensed Ontology						
	Functions	Semiotics (Data, Information, Knowledge)	Curriculum	Agents	Outcomes	
[A system to]	Acquire/Collect	[+] Cultural Heritage	[data/info/knowledge to match collections &] Syllabi	[to aid] Students	[to] Investigate	[cultural heritage]
	Create/Edit/Delete	Curriculum	Content	Faculty Members	Document	
	Organize/Arrange		Textbooks	CH Professionals	Preserve	
	Index/Describe/Represent		Learning Outcomes	IT Professionals	Manage	
	Store/Preserve/Sustain		Faculty	Administrators--CH Institution	Visualize	
	Secure/Authenticate		Students	Administrators--University	Educate	
	Retrieve		Pedagogy	Academic Advisors	Communicate	
	Process		Assessment	Financial Stakeholders	Access	
	Distribute			General Public	Assess	
					Plan	
				Publicize		
				Contextualize		
				Enjoy		

⁶ “Cultural heritage is the legacy of physical artefacts and intangible attributes of a group or society that are inherited from past generations, maintained in the present and bestowed for the benefit of future generations.” UNESCO, “Tangible Cultural Heritage United Nations Educational, Scientific and Cultural Organization,” 2017. <http://www.unesco.org/new/en/cairo/culture/tangible-cultural-heritage/>

Table 2. *Ontology component example, “A system to index/describe/represent cultural heritage data/information/knowledge to match collections and learning outcomes to aid financial stakeholders to contextualize cultural heritage.”*

Mapping the literature

The author and a history educator coded the literature for each dimension. The coding was binary; each element was scored for the presence or absence of the element (or its synonym). Multiple elements could be present in any record and coded accordingly. For instance, if the intended outcome of a case study was to help stakeholders to publicize and enjoy cultural heritage, Publicize and Enjoy would be both be coded “True,” and the rest of the elements in Outcomes would be coded “False.” After the reviewers coded the literature independently, the author compared both reviewers’ tallies for each element. If the totals were similar, she kept her coding for each article. However, any element with significant discrepancies between the coders was discussed and coding adjusted as necessary.

Results

The final selected body of literature consists of 56 articles, conference proceedings, books, or theses. Dating from 1969 to 2015, the bulk of the papers are from this century. The articles came from 29 different journals primarily published in the United States, with a few in UK journals, and one from Africa. The majority of journals represented are from the fields of libraries or archives, with one each from the fields of higher education and information management. The two proceedings are from digital library conferences. There is one book and one master’s thesis. The literature describes techniques, strategies, and opinions on how practitioners have or could link collections to curriculum. The papers had 386 total and 263 unique publisher or author-assigned keywords. Variants of “information and library science” and “higher education” were the most frequent keywords, while only one paper was tagged with “syllabi.”

Cultural Heritage and Curriculum Crosswalk: A Condensed Ontology									
Functions		Semiotics (Data, Information, Knowledge)		Curriculum		Agents		Outcomes	
[A system to]				[data/info/knowledge to match collections &]		[to aid]		[to]	[cultural heritage]
Index/Describe/Represent	41	Cultural Heritage	45	Faculty	32	CH Professionals	50	Educate	30
Create/Edit/Delete	26	Curriculum	37	Syllabi	27	Faculty Members	24	Manage	19
Distribute	20			Students	21	Students	17	Investigate	16
Retrieve	16			Learning Outcomes	14	IT Professionals	9	Communicate	16
Organize/Arrange	15			Pedagogy	14	Administrators--CH Institution	4	Plan	14
Acquire/Collect	9			Assessment	5	Administrators--University	3	Contextualize	14
Store/Preserve/Sustain	3			Content	1	Financial Stakeholders	2	Publicize	10
Process	3			Textbooks	1	General Public	2	Access	9
Secure/Authenticate	0					Academic Advisors	0	Document	6
								Preserve	4
								Visualize	3
								Assess	2
								Enjoy	1

Table 3 *Map of current practice for matching collections to curriculum, in descending order of frequency.*

Table 3 shows the mapping results, with the elements in each dimension sorted in descending order of frequency. Since multiple elements could be chosen for each article, the total (not shown) for a dimension would be more than the number of records (56). The Function with the highest score is index/describe/represent (41/56). In descending order, the top elements are Index/Describe/Represent, Create/Edit/Delete, Distribute, Retrieve, and Organize/Arrange. The lowest scores are Acquire/Collect, Store/Preserve/Sustain and Process, with zero incidences of Secure/Authenticate.

The literature more often describes the Semiotics of Cultural Heritage (45/56) than it does Curriculum (37/56). Faculty (32/56) is the most common curricular element matched to collections. Other top Curriculum elements are Syllabi, Students, Learning Outcomes, and Pedagogy. The lowest ranked are Assessment, Course Content, and Textbooks the Agents aided by this matching are Cultural Heritage Professionals (50/56), who scored more than

double Faculty Members (24/56) or Students (17/56). The remaining Agents had lower scores, ranging from 9 down to 0: IT Professionals, Administrators-- CH Institution, Administrators--University, Financial Stakeholders, the General Public and Academic Advisors.

The outcome with the highest count is Educate (30/56). There is a stiff drop-off to the next highest, Manage (19/56), followed by Investigate, Communicate, Plan, Contextualize, and Publicize. The lowest scores are for Outcomes that aim to Access, Document, Preserve, Visualize, Assess, and Enjoy cultural heritage.

The frequency of individual elements provides a quantitative picture of how the selected literature mapped onto the Cultural Heritage and Curriculum Crosswalk Ontology. The elegance of the ontological structure is that the results can be transformed into English sentences by concatenating the elements with the connecting phrases into components. In so doing, we can begin to answer the questions of how and why librarians and archivists match primary source collections to university curriculum.

Findings

The highest ranking component, composed of the highest-ranking elements in each dimension is:

[A system to] index/describe/represent [+] Cultural heritage [data/info/knowledge to match collections etc.] Faculty [to aid] CH professional [to] Educate [about] [cultural heritage]

To put it more succinctly, as a profession, our main strategy for curriculum inclusion is to tell faculty about our collections in order to help us educate their students. Although individual elements in this component were present in 30 to 50 papers (Table 3), taken as a whole only nine papers have all of the top scoring elements in their projects, including the work of Christine Borgman et. al, "How Geography Professors Select Materials for Classroom Lectures: Implications for the Design of Digital Libraries."⁷

To find the component that describes the most papers, the ontology can be collapsed, omitting some dimensions. Twenty-nine papers out of 56 papers, have projects that "match collections to faculty to aid cultural heritage professionals." Twenty-six papers "help cultural heritage professional educate [about] cultural heritage." In both subgroups, 16 papers list faculty members as the agents who are also helped, including Kelly E. Miller and Robert D. Montoya "Teaching and learning Los Angeles through engagement with UCLA library special collections."

The next highest ranked full component is:

[A system to] Create/Edit/Delete [+] Curriculum [data/info/knowledge to match collections etc.] Syllabi [to aid] Faculty Members [to] Manage [cultural heritage]

In other words, we look at syllabi to find courses that could use our collections, and create course material to help faculty manage cultural heritage. All the elements in this component describe two papers, Borgman et al. and Stephen Kutay "Advancing Digital Repository Services for Faculty Primary Research Assets: An Exploratory Study."

Six papers are described by the third highest ranked component:

[A system to] Distribute [+] Curriculum [data/info/knowledge to match collections etc.] Students [to aid] Students [to] Investigate [cultural heritage]

That is, working through students, we distribute course information to help students investigate collections. This group includes Anne Bahde, "Taking the Show on the Road: Special Collections Instruction in the Campus

⁷ Christine L., Borgman, Gregory H. Leazer, Anne Gilliland-Swetland, Kelli Millwood, Leslie Champeny, Jason Finley, and Laura J. Smart. "How Geography Professors Select Materials for Classroom Lectures: Implications for the Design of Digital Libraries." In *Digital Libraries*, 2004. Proceedings of the 2004 Joint ACM/IEEE Conference on, 179-85-85.

Classroom.”⁸

No single paper is described by the lowest ranking components below:

- [A system to] Process [+] Curriculum [data/info/knowledge to match collections etc.] Course Content [to aid] the General Public [to] Assess [cultural heritage]
- [A system to] Secure/Authenticate [+] Curriculum [data/info/knowledge to match collections etc.] Textbooks [to aid] Academic Advisors [to] Enjoy [cultural heritage]

The lack of a paper for these components is not surprising given the unlikely scenario of authenticating curricular knowledge to help the public enjoy cultural heritage by matching collections to textbooks. The low number of papers for any given component or element, reflecting gaps in practice, has a variety of causes. Some of these gaps are a logical consequence of the selection criteria. This scoping study would naturally favor academic stakeholders over other non-academic stakeholders. While the leap from curriculum to the general public may even seem to be nonsensical. In fact, processing a collection so that a class on public history could create an exhibit for non-campus attendees is quite a familiar scenario. Yet no paper is described by the component expression of that scenario (below), which may reflect a lack of research rather than a gap in actual practice:

[A system to] Process [+] Cultural Heritage [data/info/knowledge to match collections etc.] Course Content [to aid] the General Public [to] Enjoy [cultural heritage]

What are we overlooking?

Many low-scoring elements in the ontology suggest opportunities for expanding research and practice. For instance, only one paper uses course content or textbooks to find collections for courses.⁹ Only 9 of 56 papers discuss using course assessment as a vehicle for expanding our audience. Mining these data rich sources could lead us to learning which courses could be utilizing our primary sources holdings.¹⁰ After faculty contact, in nine of 56 papers, collections were acquired to meet the needs of a course. A needs assessment of faculty might identify new possible collecting areas.

Half as many papers discuss projects to directly help faculty (24) as discuss projects that help librarians and archivists (50). Could we improve our reach into courses if we focused on faculty needs? Three papers of the 56 project that would help university administrators. Would more research into how to help administrators contextualize and publicize cultural heritage build more support for instructional programs? Only one article discusses linking collections and curriculum to help the enjoyment of cultural heritage for any audience.¹¹ Could we build more support from donors by showing them the connection between their donated papers and courses?

No papers look at ways to match collections to classes to support the work of academic advisors. Could a recommender system could be explored to correlate course content to collections to give academic advisors opportunities for students to study cultural heritage? “If you liked working with the Chicago Urban League collection in that course, perhaps you’d like to take this course.”

⁸ Anne Bahde, “Taking the Show on the Road: Special Collections Instruction in the Campus Classroom.” *RBM: A Journal of Rare Books, Manuscripts and Cultural Heritage* 12, no. 2 (September 21, 2011 2011): 75-88.

⁹Michael A. Casey and Michael A. Flannery. "Utilizing the Past in the Present Curriculum: Historical Collections and Anatomy at the University of Alabama School of Medicine." *Journal of the Medical Library Association* 91, no. 1 (2003): 85-88.

¹⁰ A pilot study by the author, Caroline Brown, and Lee Konrad, which was not included in the mapping, uses textbooks to match collections to courses, “Linking Special Collections to Classrooms: A Curriculum to Collection Crosswalk,” *The American Archivist* 79, no. 2 (2016).

¹¹ Matt Gorzalski, "Archives and Non-Humanities Students." *College & Research Libraries News* 76, no. 3 (2015): 144-46.

No papers secure or authenticate cultural heritage or curriculum in the link between the two domains. Yet the authenticity of primary sources holdings is arguably the main selling point for inclusion of our content in curriculum. Would we have assessment of our work by financial stakeholders such as legislators improve if we show how our collections are used in courses?

What are we overusing?

Outreach to faculty is the dominant method (32/56) of getting our holdings incorporated into courses. In practice, the mainstay of most academic libraries and archives plans to increase curricular use of their holdings is to contact more faculty. Have we reached a limit of what this technique will yield? Given the continued underutilization of our collections, trying new avenues into the curriculum would be most fruitful strategy. Our research is primarily about how to help cultural heritage professionals (50/56). Would researching ways to improve “student success” directly be a better approach for bringing students into our reading rooms?

The Cultural Heritage and Curriculum Crosswalk Ontology provides a succinct structure for systematically mapping literature at the intersection of the domains of cultural heritage and curriculum. The mapping describes, quantitatively, the patterns of our current research and practice, as well as a highlighting where our future practice and research could go.

Limitations of the method and plans for future research

The author’s original intent with this review was to use key literature to show the range of practices, not to show the absolute numbers of each aspect of practices. Consequently, when she found additional literature that replicated the topic of a majority of other mapped material – outreach to and collaboration with faculty to help archivists– she excluded it. The omission means the picture of the state of practice painted by this review is less definite than it could have been. However, since the thrust of the omitted literature echoes the dominant results of the literature mapped in this study, the net effect of the omission is likely to be that of understating the results.

Examining the frequency of each element in the literature is only first step in understanding of the current state of research and practice. Analyzing the relationships between the elements is needed to provide a more nuanced perspective. The next phase of the research will cast a wider net to find relevant literature, which will be mapped onto an expanded version of the ontology. Yaco, Arkalgud Ramaprasad and their colleagues plan to do more sophisticated meta-analysis with the new data to understand the correlations and clusters within the literature. This analysis will provide a more finely detailed picture of the patterns of research and practice of connecting our holdings with curriculum.

Conclusion

The Culture Heritage to Curriculum Crosswalk Ontology provides a powerful tool to understand how we currently work and what else we could be doing to improve utilization of cultural heritage collections. A similar ontology could be used to explore the crosswalk between K-12 educators and public libraries or archives and archival/information literacy programs. In this small study, we have used the ontology to systematically map research literature, identified gaps in research and practice, and suggested a roadmap of future research. How do we integrate primary sources into higher education curriculum? We mainly find opportunities to bring collections into courses by connecting with faculty and to a lesser extent by examining syllabi. The literature shows that we plow one row very well - matching collections to faculty to help librarians and archivists educate their students about our holdings. The rest of the field is lightly plowed, or completely untouched, leaving opportunities for growth as a profession. The Culture Heritage to Curriculum Crosswalk Ontology shows 16,848 possible ways to find courses to use our rich resources and find collections that meet university curricular needs. While some of those combinations are impractical, many represent new access points for furthering the

educational missions of all academic stakeholders.

Resources

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<http://dx.doi.org/10.1080/1364557032000119616>

Bahde, Anne. "Taking the Show on the Road: Special Collections Instruction in the Campus Classroom" xxx

Borgman, Christine L., Gregory H. Leazer, Anne Gilliland-Swetland, Kelli Millwood, Leslie Champeny, Jason Finley, and Laura J. Smart. "How Geography Professors Select Materials for Classroom Lectures: Implications for the Design of Digital Libraries." In *Proceedings of the 4th ACM/IEEE-CS Joint Conference on Digital Libraries*, 179-85. Tucson, AZ, USA: ACM, 2004.

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Appendix A Glossary

- CH: Cultural Heritage
- Crosswalk “n. ~ 1. The relationships between the elements of two or more data structures. - 2. A chart or diagram that indicates the correspondence between two systems.” Richard Pearce-Moses, A Glossary of Archival and Records Terminology (2016) <http://archivists.org/glossary>.
- The Cultural Heritage and Curriculum Crosswalk Ontology
Functions: The functions of the system.
 - Acquire/Collect: To acquire/collect data/information/knowledge about cultural heritage and curriculum.
 - Create/Edit/Delete: To create/edit/delete data/information/knowledge about cultural heritage and curriculum.
 - Distribute: To distribute data/information/knowledge about cultural heritage and curriculum.
 - Index/Describe/Represent: To index/describe data/information/knowledge about cultural heritage and curriculum.
 - Organize/Arrange: To organize/arrange data/information/knowledge about cultural heritage and curriculum.
 - Process: To process data/information/knowledge about cultural heritage and curriculum.
 - Retrieve: To retrieve data/information/knowledge about cultural heritage and curriculum.
 - Secure/Authenticate: To secure/authenticate data/information/knowledge about cultural heritage and curriculum.
 - Store/Preserve/Sustain: To store/preserve/sustain data/information/knowledge about cultural heritage and curriculum.

Semiotics: Symbolic representations of cultural heritage and curriculum at different levels of abstraction, which consists of data, information, and knowledge.

Curriculum: A systematic plan for knowledge transmission, generally in a university.

- Assessment: The assessment of the teaching of and learning from the courses in the curriculum.
- Content: The content of the course.
- Faculty: The faculty members teaching the courses in the curriculum.
- Learning Outcomes: The learning outcomes desired from the courses in the curriculum.
- Pedagogy: The method of teaching the courses in the curriculum.
- Students: The students taking the courses in the curriculum.
- Syllabi: A description of the structure of the courses in the curriculum.
- Textbooks: Physical or digital media (including books, audio-videos, articles, maps) embodying the common body of knowledge regarding the subject of the courses in the curriculum.

Agents: The agents to obtain the various outcomes regarding cultural heritage.

- Academic Advisors: The academic advisors to students and faculty members.
- Administrators CH institutions: The administrators of cultural heritage institutions (library, archives, and museums) and the outcomes.
- Administrators University: The university administrators of cultural heritage and the outcomes.
- CH Professionals: the cultural heritage professionals responsible for the outcomes.
- Faculty Members: The faculty members of cultural heritage.
- Financial Stakeholders: the financial stakeholders in the cultural heritage and outcomes, including Legislators, development/advancement staff, and donors.
- General Public: Public at large.
- IT Professionals: The information systems professionals responsible for the system and its outcomes.

- Students: The students of cultural heritage.

Outcomes: 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 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 Mapped literature

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