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Angel Clemons

University of Louisville, angel.clemons@louisville.edu

Tyler Goldberg

University of Louisville, tyler.goldberg@louisville.edu

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Undergraduate Student Works in Institutional Repositories An Analysis of Coverage, Prominence and Discoverability

Angel Clemons and Tyler Goldberg

Angel Clemons is an Electronic Resources Librarian at Ekstrom Library of the University of Louisville and can be reached at angel.clemons@louisville.edu. Tyler Goldberg is the Head of Technical Services & Collection Development at the Ekstrom Library of the University of Louisville and can be reached at tyler.goldberg@louisville.edu.

Introduction

Institutional repositories (IRs) have evolved to showcase a wide-variety of authors and types of material. The early years of IR development focused on collecting and presenting faculty research, primarily in the form of research papers. Graduate theses and dissertations soon began to be incorporated into the scope of IR collection policies and have become as common in IRs as faculty research. Undergraduate research, however, appears to be much less common than faculty or graduate work. This paper examines the extent to which undergraduate student works (USW) are represented in the IRs of U.S. colleges and universities that use bepress' Digital Commons product. Types and sizes of collections, span of coverage, prominence, and discoverability are considered. The authors hypothesize that USW are underrepresented in IRs and are not easily discoverable due to lack of available cataloging.

Literature Review

The history of IRs in academia begins, essentially, in the year 2000 with an agreement between Hewlett Packard and the Massachusetts Institute of Technology (MIT) "to create an infrastructure for storing the digitally born, intellectual output of the MIT community and to make it accessible over the long term to the broadest possible readership" (Baudoin & Branschovsky, 2003, p. 32). This resulted in DSpace, a software that would preserve and enable "easy and open access to all types of digital content including text, images, moving images, mpegs and data sets" (DuraSpace, 2018).

A few months prior to the launch of DSpace in November 2002, the Scholarly Publishing and Academic Resources Coalition (SPARC), released its position paper on IRs in academic institutions that defined an IR as "a digital archive of the intellectual product created by the faculty, research staff, and students of an institution and accessible to end users both within and outside of the institution, with few if any barriers to access" (Crow, 2002, p. 2). SPARC further noted that the content of an IR should be "institutionally defined, scholarly, cumulative and perpetual, and open and interoperable" (p. 2). Clifford Lynch (2003), in his article *Institutional Repositories: Essential Infrastructure for Scholarship in the Digital Age*, similarly defined an IR as "a set of services that a university offers to the members of its community for the management and dissemination of digital materials created

by the institution and its community members" (p. 2). He went on to state that "a mature and fully realized institutional repository will contain the intellectual works of faculty and students-both research and teaching materials and also documentation of the activities of the institution itself in the form of records of events and performance and of the ongoing intellectual life of the institution" (p. 2).

During the years 2005-2007, four major studies emerged on the overall landscape of IRs in academic institutions. The first was a survey in early 2005 conducted on behalf of the Coalition of Networked Information (CNI) by Clifford Lynch and Joan Lippincott that was designed to provide an overview of the current status of IRs (Lynch & Lippincott, 2005). The survey, which consisted of eleven questions, was sent via email to 124 member academic institutions that were CNI members, and an additional 81 consortia members. The response rate was 78.2% of the 124 member institutions, all of which were doctoral granting universities, and 43.8% of the consortia member institutions (Lynch & Lippincott, 2005). Of the respondents, 40% had an operational IR and 88% of those who did not were in the planning phase of implementing one (Lynch & Lippincott, 2005). Lynch noted several emerging trends that might increase participation in IRs over time, including the adoption of student portfolios and electronic theses and dissertations. Of the survey respondents, nine already included student papers other than theses or dissertations, while another 14 respondents planned to include these materials (Lynch & Lippincott, 2005). Lynch noted that "because the outreach to faculty can be a slow, incremental, somewhat piecemeal process, some institutions begin populating their IRs with the work of their students, rather than their faculty, as a quick means of acquiring a substantial body of a specific type of content. An electronic theses and dissertations (ETD) program is one such approach" (Lynch & Lippincott, 2005).

The following year, the Association of Research Libraries (ARL) published a SPEC Kit detailing an extensive survey that it conducted in 2006 of 123 ARL member libraries (Bailey, 2006). It was designed to collect "baseline data about ARL member institutions' institutional repository activities" (Bailey, 2006, p. 23). Of the 87 responses that ARL received, 37 institutions had an operational IR (70% of which came online in 2004-2005), 31 were planning for one in the following year, and 19 had no immediate plans (p. 13). At the time of the survey, the authors wrote that "while the growth rate appears to be leveling off at this

point, IRs will continue to be developed and implemented in the near future” (p. 13) with the top three priorities being “to increase global visibility of, preserve, and provide free access to the institution’s scholarship” (p. 14). The surveyors found that “respondents place a wide variety of materials in their repositories” (p. 17) with the most common type being electronic theses and dissertations, followed closely by articles (including preprints and post prints), and to a lesser extent, conference presentations, technical reports, working papers, data sets, learning objects, and multimedia materials (p. 17). At the time of the survey, 73% of respondents with IRs included student produced materials.

Also in 2006, a large scale census of IR activities in the US was conducted by staff of the MIRACLE (Making Institutional Repositories and Collaborative Learning Environment) Project, a project funded by the Institute of Museum and Library Services (IMLS) (Markey, Rieh, St. Jean, Kim, & Yakel, 2007). Project staff contacted 2,147 academic libraries and received responses from 446 (20.8%) institutions. The study focused on answering thirteen questions ranging from what kinds of educational institutions have and do not have IRs, to what progress have respondents made on IR policies, to what are the benefits of IRs? When looking specifically at the type of content found in IRs, MIRACLE project staff identified and collected data on 36 document types. Those related to student works included doctoral dissertations, senior and master’s theses, undergraduate and graduate student e-portfolios, undergraduates’ and graduates’ class notes, outlines, assignments, papers, and projects, and raw data files that result from masters and doctoral research (Markey et al., 2007). Doctoral dissertations and master’s theses appeared among the top five most common types of document types in both pilot test IRs and operational IRs (Markey et al., 2007). Senior theses appeared in the top ten document types for both pilot test and operational IRs, while student e-portfolios and student class notes, outlines, assignments, papers and projects appeared among the least common document types (Markey et al., 2007). Undergraduate students were authorized contributors to IRs in 48.5% of the institutions surveyed (Markey et al., 2007).

In a follow-up to Lynch and Lippincott’s 2005 survey of IRs, McDowell utilized a more sophisticated method of information-gathering to expand on the baseline data created by the original survey (2007). The author used several online resources (e.g., DSpace Instances Wiki, Registry of Open Access Repositories, etc.) to monitor the addition of American IRs over a two-year period (McDowell, 2007). McDowell argued that the projects undertaken by ARL in 2006 and Lynch and Lippincott in 2005 underrepresented the growth of IRs in US academic institutions, as her method uncovered a much larger number of implementers (2007). McDowell’s study focused on repository size and growth as well as types of materials found within. Interestingly, McDowell found that “student work accounts for the largest percentage of items in IRs. Approximately 41.5% of all items in American academic IRs were student-produced, including over 93,000 ETDs. Another 11,000 items, or 4.5% of repository

contents, were other student-created works, primarily senior honors theses” (2007). Like Lynch and Lippincott, and the ARL survey, this study revealed that nearly from the beginning, student work played a prominent role in the creation of IRs.

In the midst of this three-year period that produced sweeping studies on IRs, Nolan and Costanza wrote about a joint project between Trinity University and Carleton, Dickinson, and Middlebury Colleges to develop a consortia level IR that was designed to promote student work, specifically undergraduate theses (2006). Although promoting and archiving were “sufficient reasons to justify an IR”, they also wanted their students “to develop some conception of the issues surrounding copyright, fair use, licensing, and alternative publishing models” (Nolan & Costanza, 2006, p. 92). These libraries, which formed the Liberal Arts Scholarly Repository (LASR) consortium, contracted with Berkeley Electronic Press (bepress) to create an IR called *Digital Commons CDMT* (Nolan & Costanza, 2006). Nolan and Costanza noted that “our student thesis project has a substantial advantage over faculty-oriented archives: students understand the benefits of the online repository much faster than faculty and staff” (p. 97).

While the literature reveals several articles written in the years following the 2005-2007 period of large-scale studies (Markey, St. Jean, Rieh, Yakel, & Kim, 2008; Xia & Opperman, 2010; Nykanen, 2011; Owen, 2011; and Connell, 2011), it wasn’t until 2014 that two more studies were published that focused primarily on undergraduate work in IRs. In order to determine where undergraduate theses were being cited, Stone and Lowe identified 49 IRs with undergraduate research collections containing a total of 20,024 undergraduate theses (2014). Using the forward citation feature of Google Scholar, they first eliminated 895 theses that had no citations in Google Scholar. For the remaining undergraduate theses, they determined that 24% of citations were in peer-reviewed or refereed journals and 33% in dissertations and theses (Stone & Lowe, 2014, p. 345). Like Nolan and Costanza in 2006, Stone and Lowe concluded that “making theses available to the wider scholarly community brings students into the conversation about vital information use, publishing, and scholarship issues” (p. 356).

The second article that focused on undergraduate research in IRs was a case study in which Eleta Exline outlined the benefits, challenges, and concerns of collecting undergraduate research based on the University of New Hampshire’s experience with extending their UNH Scholars’ Repository to include undergraduate honors theses (Exline, 2014). While the initial purpose of their project was to “eliminate collecting paper copies of theses and to give students searchable access to past projects” (Exline, 2014, p. 25), UNH soon found that there was “stronger campus support and fewer barriers to collecting undergraduate research than for faculty and graduate student scholarship” (Exline, 2014, p. 16). Exline noted that “the process [of collecting undergraduate honors theses] was unexpectedly straightforward and relatively

easy in comparison with our efforts collecting faculty and graduate student work” (p. 19). There were concerns however “about the ability to publish from previously deposited work, the potential for plagiarism, and exposure of confidential or proprietary research when students worked on ongoing faculty projects” (Exline, 2014, p. 26). The benefits outweighed these concerns though as Exline pointed out that “the Scholars’ Repository can help us make and sustain connections across the university, contribute more broadly to the teaching and research mission, and support students in their aspirations as undergraduate scholars and beyond graduation” (p. 25).

Despite the seemingly steady increase in inclusion and availability of USW in IRs, Fagan and Willey conducted a study of “the web visibility of award-winning history papers written by undergraduate students” to determine the level of accessibility of this type of research (Fagan & Willey, 2018, p. 164). The researchers used Google, Google Scholar, Microsoft Academic, *America: History and Life*, *Historical Abstracts*, and the institution’s IR to gauge discoverability. The results of their study suggested that “the discoverability of undergraduate history research is limited and that it is more discoverable on the public web than within the scholarly network” (p. 175). Fagan and Willey pointed out that because “undergraduates are becoming recognized as emergent authors” (p. 179), academic libraries need to improve the visibility and accessibility of undergraduate research. The easiest way to do that is to continue to strengthen the support for inclusion of undergraduate research in IRs and “to prioritize structuring of those repositories for discovery by web search engines” (Fagan & Willey, 2018, p. 179).

Institutional repositories began as a simple system to store the digital output of a single community. Over the last 20 years, IRs have morphed into more elaborate digital archives that play a vital role in preserving the scholarly output and events and activities of an academic institution. Early proponents called for a scholarly system of preserving the research and teaching materials of both faculty and students, with few barriers to access, that was cumulative and perpetual, open and interoperable. In their infancy, institutions began populating IRs with student work to supplement the slower growing output of faculty. Student produced electronic theses and dissertations became a common type of material found in IRs, due to the availability of a large amount of content with few barriers to acquiring and uploading it. Institutions benefitted by growing their digital archives quickly, while students benefitted by being engaged in a scholarly process that encouraged conversations around copyright, licensing and alternative publishing models. Nearly from the beginning, both graduate and undergraduate student works played a prominent role in the creation of IRs.

Methodology

The authors gathered data for this project by reviewing the online holdings in IRs of U.S. college and university libraries that use bepress’ Digital Commons product to

publish the work of scholars at their institution. Bepress lists their clients according to type of institution (e.g., colleges and universities, liberal arts schools, research universities, law schools, community colleges, medical schools, etc.). The Colleges and Universities category was selected as the focus of this study. Foreign colleges and universities were eliminated from the list. The remaining institutions ranged in size from small to large, were both public and private, and represented all geographic regions in the United States. There were 329 institutions on bepress’ list of colleges and universities. Sixteen of those were foreign institutions and were eliminated from the study. One hundred six institutions contained no works that would qualify as USW and were also eliminated from the study. The remaining 207 institutions were evaluated according to the criteria outlined in the Methodology section of this paper.

In order to determine the extent to which USW are represented in each IR, the authors looked at four criteria: types of collections, size of collections, coverage, and discoverability. First, the types of USW collections available in each repository (e.g., honors theses, capstone projects, posters, etc.) were analyzed. Second, the number of USW contained within the repository were noted and assigned a range (i.e., <50, 50-200, >200) in order to avoid counting each individual work, which would have been impossible given the size and number of collections and the fact that the authors extracted the data manually instead of exporting it with a computer program. Next, the coverage of those collections was considered and the starting and ending dates were noted along with any outliers. For example, if undergraduate collections coverage in the IR ranged from 2011-2016 but there were a handful of items from 1975 and 1983, those items would be noted as outliers. Finally, both the prominence of the USW within the IR and the availability of OCLC records were observed. The authors wanted to know how easily discoverable these items were. In terms of prominence, if the USW collections were linked on the main page of the IR, they were considered prominent. If they were embedded 2-3+ layers deep, they were not considered prominent. Also, a random sample of the records of each institution’s USW collections were searched in OCLC to determine if the items had been cataloged. If cataloging was available, the authors noted the earliest and latest dates of the works that were present in OCLC.

The data associated with each criteria was extracted manually through a visual analysis of each institution’s IR. The author reviewed the IR website at each individual institution using a list of URLs found on the bepress website. Each URL linked directly to the IR’s main page. The author selected the Browse Collections link from the navigation side bar to access a list of the content in the IR. Some of the content was organized by academic department while others were organized by contributor category (e.g., undergraduate, graduate, faculty, etc.). For the content organized by academic department, undergraduate collections within that department were identified based on the title of the collection (e.g.,

undergraduate student papers, honors theses, capstone projects, etc.). If it was unclear by the title that the collection consisted solely of undergraduate work, the authors reviewed individual records within the collections in question to determine if they were undergraduate in nature. Data was collected manually and input into an Excel spreadsheet.

Findings

Five criteria were examined to determine the extent that USW were represented in the IRs of U.S. colleges and universities that use bepress' Digital Commons product: types and sizes of collections, span of coverage, prominence, and discoverability.

Types of Collections

The first criteria considered was types of collections. Many different names were used to refer to collections by the 207 institutions, but thirteen categories emerged when grouping the various types together. Table 1 defines the categories and provides examples of types of collections within each.

The most widely represented type of collection among the 207 institutions was theses, with 114 institutions (55%) having digitized and made available some variation of undergraduate theses in their IR. The second most widely represented type of collection was papers, which 91 institutions (44%) made available in their IR. The distribution of the other types of collections defined above is illustrated in table 2.

Size of Collections

The measurement of the second criteria, size of collections, was simplified by using a range of sizes (e.g., <50, 50-200-, >200) to portray the extent of each collection. The difference in range of sizes among institutions was much smaller than the wide gaps seen in types of collections. The sizes were much more evenly spaced at 35% (72) of institutions with less than 50 USW in their collections, 33% (69) of institutions with 50-200 USW in their collections, and 32% (66) of institutions with >200 USW in their collections.

Coverage and Outliers

The authors were able to determine coverage for 204 of the 207 institutions under study (table 3). The number of years of coverage among the institutions ranged from 1 year to 102 years. The majority of institutions (77) had five years or less of coverage. Ninety-one institutions had 6-15 years of coverage, and the remaining 35 institutions had between 16 and 102 years of coverage. The oldest date of beginning coverage was 1878, and the most recent beginning date of coverage was 2017. The majority of institutions (143) had beginning coverage dating from 2006-2016. Thirty-one institutions had coverage beginning during the time period 1996-2005, and only 24 institutions had coverage beginning prior to 1996. The majority of the institutions (169) included USW in their IR that were dated as recently

as 2016-2018. Twenty-one institutions had end dates between 2012 and 2015, and one institution had an end date of 1941. The thirteen single date institutions were not considered in these calculations.

Only 19% (39) of the institutions had outliers. Outlying works were defined as those works that were produced outside the years that clearly defined the start of the IR. Twenty-two of those 39 institutions had only one outlying year. The other seventeen institutions ranged from 2 to 10 outlying years. All but three of the institution's outlying years were dated earlier than their main span of coverage.

Prominence

The authors categorized 119 institutions as having prominent undergraduate collections. These collections were all linked on the main IR page. The other 88 were not considered prominent within the institution's IR, as they were not easily discoverable. In order to find the USW at these institutions, the authors had to navigate 2-3 layers into the IR to find them. While somewhat subjective, the authors expected that USW would be easily discernable without trying to examine every work individually. For example, theses collections that combined masters, doctoral, and undergraduate in the same collection were not considered as displaying USW in a prominent way.

Discoverability

A random sample of titles from each institution was searched in OCLC for the availability of cataloging records. Seventy-two percent (150) of the institutions had not cataloged their USW. The remaining 28% (57) were institutions who cataloged their USW to varying degrees. Of the 28% of institutions who cataloged their USW, 35 (61%) cataloged the entire range of their student works from earliest date of coverage to latest date of coverage. Sixteen institutions (28%) cataloged the earlier years in their span of coverage but had not cataloged their most recent student works. Three institutions (5%) cataloged the most recent years, but had not yet cataloged their older works. And the remaining 3 institutions (5%) cataloged content falling somewhere in the middle of their span of coverage, bypassing the earliest and latest years.

Discussion

Digital Commons provides institutions the means to showcase a vast array of scholarship, and, while there is a basic framework, there can be a great deal of variety in how the institution chooses to organize its IR, as well as a great deal of variety in the kinds of collections that the institution chooses to add. The authors focused on discovering USW.

In examining the 207 institutions that had undergraduate works, table 1 shows that there is a wide variety of types of works that institutions have chosen to add to their digital collections. Institutions promote everything from art work, posters, and podcasts to the more "traditional" undergraduate papers. Not surprisingly, theses and papers dominate undergraduate scholarship in bepress.

Institutions that have yet to consider undergraduate work outside of theses and papers will find a wide variety of items that might be considered for inclusion to their digital collections.

As noted, the authors chose to simplify counting the number of items in any individual repository by using ranges to determine size. Of course, the size of the collection can be based on many factors, including size of institution, length of time the institution has had an IR, restrictions on the type of items that can be added, and the number of staff dedicated to adding materials to the repository. While some larger institutions had over 200 items in the undergraduate collections, there were several institutions with enrollments under 2000 students that also were in this category. Institutions that feature a wider variety of collection types typically have more items, if only because there are more USW that can be added to various collections. Additionally, those institutions that have had an institutional repository for a number of years may have more works than an institution that only recently began adding items to its IR.

While coverage varied widely, the majority of items in the IRs examined are dated after 2016. Projects to digitize older print USW require time, funding, and staffing. At the authors' institution, written permission to digitize must be given by the author, adding a criterion that is difficult, if not impossible, to accomplish. As noted, only a small percentage (19%) of the institutions had outliers. While it is impossible to determine the exact reason that these undergraduate works were added to all collections, at the authors' institution these outliers are due to a former student discovering the IR and formally requesting that his/her work be added.

In seeking USW, the authors found that the majority of IRs linked those collections on the main page, but 88 institutions made it more of a challenge to identify them. Repositories that specifically listed undergraduate scholarship as a collection made discovery of USW very easy. Student works, student scholarship, and other collection names that didn't specify undergraduate, could include both undergraduate and graduate works, and the user would have to go further into the collection to see if USW were present. USW were also found in collections under the broader bepress heading research unit, center or department. Again, some collections listed under this broad heading specified undergraduate works, while others required the user to examine a student work collection to find undergraduate works. Repositories that were organized so that USW were listed under individual academic departments or schools were not considered to display USW prominently. Particularly in these cases, it would

have been time consuming for the authors to identify and count USW because they could only be found by looking through every school or department. Those repositories that combined both undergraduate and graduate theses in the same collection were not considered to display undergraduate research in a prominent way. A user would have to examine each thesis individually to determine whether it was for an undergraduate or graduate degree. There were a handful of institutions that required a password to access all works in their IR, so that while USW might appear to be prominently displayed, further examination was impossible.

The authors also searched OCLC for records in order to determine whether the majority of repositories were adding records to OCLC to increase discoverability. Print honors theses at the authors' institution were sent directly to Archives and Special Collections, and were not cataloged. Digital honors theses are now discoverable through the Libraries' IR. Since the graduate ETDs had always been cataloged, a decision had to be made about cataloging undergraduate theses. Given the time needed to catalog the undergraduate theses, and a shrinking cataloging staff, the authors were curious whether other bepress institutions were adding these records to OCLC. For 72% of the institutions, it appeared that cataloging records for USW in the repositories examined were not being added to OCLC. Generally, if an institution cataloged undergraduate works in OCLC, cataloging started with the earliest work in the collection and continued to the most recent work in the collection. In a few cases, it appeared that cataloging in OCLC had been done for earlier works, but appeared to have ceased. While cataloging these materials might happen at some future date, there was no way for the authors to determine why newer works were no longer being added to OCLC even though older works had OCLC records.

Conclusion

The authors found that the original hypothesis was not correct. USW are well represented in the IRs that were examined in bepress. The authors found a wide variety of undergraduate works. Finding USW is easiest in those IRs that maintain collections that contain only these works. Student work collections that contain both undergraduate and graduate works require more effort to distinguish between the two, but it can be done. Those institutions that require that patrons examine each collection under individual schools and departments to find USW might consider creating a student work collection. Finally, while OCLC cataloging records are not available for the vast majority of USW, these works are still being discovered by users worldwide.

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Table 1. Types of Collections Defined

Types of Collections Defined
ART: painting, photography, exhibitions, mixed media
ARTISTIC PERFORMANCES: student concerts and recitals, songs
AWARDS: award winning papers and essays, images of award plaques, grants
CREATIVE WRITING: essays, poetry, short stories, fiction, creative non-fiction
MISCELLANEOUS: flyers, charts, maps, abstracts, learning objects, data sets
PAPERS: symposium papers, creative papers, senior scholar papers, seminar papers, conference papers
POSTERS: poster session images
PRESENTATIONS: class presentation, conference presentations
PROJECTS: senior projects, undergraduate projects, honors projects, senior capstone projects
PUBLICATIONS: undergraduate journals, student newspapers, yearbooks
REPORTS: internship reports, class project reports, case studies
SOCIAL MEDIA: podcasts, live tweets, videos, blog posts
THESES: honors theses, undergraduate theses, senior capstone theses, oral defenses

Table 2. Distribution by Type of Collection

Type of Collection	# of Holding Institutions	% of Institutions
Theses	114	55%
Papers	91	44%
Projects	42	20%
Publications	39	19%
Posters	31	15%
Presentations	27	13%
Art	14	7%
Awards	14	7%
Social Media	11	5%
Creative Writing	9	4%
Miscellaneous	9	4%
Reports	8	4%
Artistic Performances	6	3%

Table 3. Span of Coverage

