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Contemporary Instructor-Librarian Collaboration: A Case Study of an Online Embedded Librarian Implementation

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This paper reports the results of a case study evaluation of an embedded librarian project at a large, land-grant, research institution. The case is comprised of learners who are full-time academic health care professionals enrolled in an online graduate educational technology program. The mixed methods methodology focused on assessing the embedded librarian's impact upon the information literacy competency of the participants. Results support the documented literature by indicating that embedded librarians are of value to online students. The course instructor's experience with the design, development, implementation, and evaluation of the embedded librarian project are emphasized in the presentation, providing unique faculty insight into collaborating with librarians. Recommendations for the assessment of embedded librarian projects include the need for future studies to investigate various contexts and the use of other methodologies to provide stronger empirical evidence.

KEYWORDS *embedded librarianship, faculty collaboration, assessment, online learning*

INTRODUCTION

Increasing student enrollments and the emergence of diverse degree programs facilitated through distance and online learning are a notable trend in contemporary higher education (Allen and Seaman 2010; 2009; 2008). While

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enrollments are expanding, perception of the quality of online learning is also increasing. The most recent Sloan-C report on online learning indicates that sixty-six percent of chief academic officers perceive the learning outcomes for online learning as “as good or better” than traditional face-to-face instruction (Allen and Seaman 2010). Increasing enrollments and positive perception illustrates that online learning is transitioning from the boundaries of educational legitimacy to its current status as a valid alternative or supplement to traditional instructional methodologies in higher education (Burder 1989; Garrison and Shale 1987; Means, Toyama, Murphy, Bakia, and Jones 2009; Moore and Kearsley, 2006). Library services and access to library materials are recognized as critical components of the multiple factors contributing to a quality distance and online learning experience (Distance Education and Training Council 2010). Libraries’ responsibility to service distance and online learners is codified in the Association of College and Research Libraries (ACRL) “Standards for Library Services to Distance Learners” (ACRL 2006a). A defining feature of the standards includes the declaration that distant and face-to-face students are entitled to equivalent library services (ACRL 2007). Librarians have responded to the ACRL standards by planning for and delivering services and instruction for distant learners (Baird and Wilson 2002; Gandhi 2003; Haynes 2002; Pace 2001; Perrone 2000).

Library instruction for distance and online learning has evolved parallel to the transition in general educational practices and is reflective of traditional library instruction. Currently, librarians are providing both “stand-alone” instruction, that is not adapted to support a specific course, and “course-integrated” instruction that is integrated into a curriculum or a specific course. Examples of current instructional efforts include online tutorials, web pages, path finders, integration into a course management system, synchronous instruction, and more recently online embedded librarians.

Embedded librarianship is a growing practice in academic libraries and as such is documented in the literature and professional associations (Bozeman and Owens 2008; Edwards, Kumar, and Ochoa 2010; Dewey 2004; Dugan 2008; Freiburger and Kramer 2009; Hall 2008; Lillard, Norwood, Wise, Brooks, and Kitts 2009; Kesselman and Watstein 2009; Matthew and Schroder 2006; Rudin 2008; Shumaker and Talley 2009; York and Vance 2009). The phrase “embedded librarian” is flexible and can have various meanings depending upon the context. Defined generally, embedded librarians are thoroughly integrated into the college, department, and courses served and provide contextualized support and instruction (Dugan 2008; Edwards, Kumar, and Ochoa 2010; Kesselman and Watstein 2009; Shumaker and Talley 2009). Course-level embedded librarians can support both face-to-face and online courses using a variety of strategies. Many successful instances of course level embedded librarianship are described in the literature (Bozeman and Owens 2008; Edwards, Kumar, and Ochoa 2010; Dewey 2004; Dugan 2008; Freiburger and Kramer 2009; Hall 2008; Lillard, Norwood, Wise, Brooks, and Kitts 2009; Kesselman and Watstein 2009; Matthew and Schroder 2006; Rudin

2008; Shumaker and Talley 2009; York and Vance 2009). One of the defining features of course level embedded librarians is the focus on integrated instruction, regardless of delivery format (face-to-face or online). Embedded librarianship requires close collaboration with teaching faculty and course instructors. Collaboration with a faculty member facilitates the close integration of library content to the needs of a course (Bozeman and Owens 2008; Chesnut et al. 2009; Dugan 2008; Hall 2008; Matthew and Schroeder 2006; Stewart 2007; Tennant and Miyamoto 2002; York and Vance 2009). Though there have been ample descriptions of embedded librarianship programs, there is a need for methodologically sound evaluations to assess their effectiveness, define best practices, and facilitate the progression of professional practice.

This paper describes the evaluation of library services embedded into an online graduate level educational technology course, "Issues in Educational Technology Research." The particular audience for this embedded librarian project is a unique group of Master's students who are full time health care professionals enrolled in a part time U.S. Department of Education-funded Masters of Education pilot program known as the OnMed program. OnMed students vary from other types of Masters students because they hold professional doctorates (Medical Doctor, Doctor of Pharmacy, and Doctor of Dental Medicine) and are experienced health professionals. Furthermore, each member of the pilot cohort was employed full-time in an academic medical center and had demonstrated a commitment to education and teaching and learning through the participation in an informal educational certificate program.

IMPLEMENTATION

The librarian was embedded in the eight-week online course EDG 6931 Contemporary Issues in Educational Technology Research. Rather than focusing on specific research methodologies, the course is designed to provide an introduction to and overview of research in educational technology, focusing on critical evaluation of current literature and research. The final deliverable for the course is an annotated bibliography focusing on a research question of interest to the student. Students are heavily encouraged to use the library content, but it is not a course requirement.

In order to design the most relevant and effective instruction, the librarian used the Morrison, Ross, and Kemp (MRK) (2006) instructional design model to plan and develop the instructional content. As the MRK model suggests, the instructional components were heavily influenced by a needs analysis, which was based on a survey of technology comfort administered by the OnMed program coordinators and close collaboration with the course instructor. For this project, the librarian and instructor met face-to-face several times before the course began. In the first meeting the course syllabus

and role of the librarian and library content was discussed in general terms, as the librarian had not yet planned or designed the instruction. The goal of the first meeting was to learn about the course, expected student needs, and the instructor's expectations for the course and the library involvement. During the second meeting the librarian had designed the instructional plan, but the specific content was not fully developed. While the course was in session the librarian and instructor communicated electronically to discuss progress and issues as needed. After the course ended a follow-up face-to-face interview explored project outcomes.

From those initial consultations with the instructor, it was determined that library instructional support should include both procedural task-oriented support (e.g., a demonstration of the MeSH browser tool) and higher level cognitive tasks designed to reinforce instructor developed content (e.g., a resource on critical evaluation of research). Based upon the needs analysis, the embedded librarian content was designed to provide both general support for the course and content specific to the course modules for six weeks of the eight week course. Table 1 includes details on the course modules and library content. All of the library content was delivered asynchronously and featured a variety of formats including LibGuides, videos, demonstrations, discussion forums, a recorded Elluminate/BB Connect session on RefWorks, and an integrated Meebo chat widget to allow for optional synchronous messaging.

METHODS

The primary research question focused on describing the embedded librarian's impact on learning and ascertaining how the students experienced the embedded librarian. Formally stated, the study asked the manner in which the presence of an online embedded librarian influenced graduate students' experience in an online educational technology research class as defined by four specific characteristics:

- Self-efficacy related to information literacy and library skills (measured by changes in performance on a pre- and post-assessment)
- Library skill performance (measured by changes in performance on a pre and post-assessment)
- Quality of graduate students' research (measured by the quality of citations in an annotated bibliography)
- Reflections on the embedded librarian experience and processes of searching for and critically evaluating the literature (as described in a written narrative)

In addition to collecting a variety of data related to the students, data from the course instruction (collected via a post-course, semi-structured

TABLE 1 Course Modules and Embedded Librarian Content

Week	Course Module	Embedded Library Content
1	Introduction	1) Introduction Forum 2) Pre-Assessment
2	Reading Research	1) RefWorks Elluminate Session 2) RefWorks Handout 3) What is an annotated bibliography 4) Critical Analysis LibGuide
3	Research Questions	N/A
4	Mid-Point	1) Peer Review & Ulrich's 2) Searching Ulrich's 3) Journal Citation Reports Video
5	Building Your Annotated Bibliography	1) ERIC demonstration video 2) MeSH demonstration video 3) Why Use MeSH video
6	Working on your Annotated Bibliography	1) Search Support (including presentation on finding medical education literature and general database search techniques)
7	Annotated Bibliography	1) Continued search support
8	Issues and Current Research	N/A

interview) and from the librarian's field notes were used as triangulation points. Using a mixed methods case study design allowed the librarian to evaluate the program and answer questions about how and why the program works (or doesn't work) (Yin 2009). Quantitative assessment strategies included a pre/post survey designed to gauge both perceived self-efficacy with library resources and actual library skill performance. Additional quantitative assessments focused on measuring the quality of the student research as measured by citation analysis, to provide indirect evidence of learning. Qualitative data sources included written student reflections, a post-course instructor interview, and the librarian's observations during the course.

In order to measure students' self-efficacy with library resources and information literacy concepts, a twelve-item instrument designed by Monoi, O'Hanlon, and Diaz (2005) was adapted with permission. The instrument

was aligned to learning outcomes described by the ACRL Information Literacy Standards and has been thoroughly validated. In addition to the self-efficacy scale, the pre/post-tests included four items designed to measure students' performance on library related tasks.

The information literacy/library skills assessments were administered through an online survey (Zoomerang) during the first and last weeks of the course (weeks 1 and 8). Responses were paired by the course instructor and de-identified prior to sending to the embedded librarian. Descriptive and inferential statistical analysis methods allowed for a thorough understanding of the data and investigation of a change in performance after the embedded librarian program was complete. Unpaired data was disregarded and paired t-tests were conducted on the remaining data to measure individual change before and after the intervention.

Students' written artifacts (in the form of an annotated bibliography) were evaluated by the librarian researcher with rubrics (used with permission from a similar study by Tunon and Brydges (2006)). The two rubrics used in the citation analysis procedure provide both objective and subjective assessment of the references without evaluating how the citations were used within the body of the assignment.

In the embedded librarian evaluation project, citation analysis (used as a measure of quality of student learning) included general descriptive analysis of the citations in the annotated bibliography assignment that focused on citation patterns, such as the mean age and frequency of references. The objective rubric assessed a point value to each reference (according to criteria such as age, type of reference, etc.) and a total score for each reference list was calculated. The subjective rubric measured the quality of reference lists through expert review of the references on criteria including breadth, depth, and appropriateness for the topic.

Citations were processed and analyzed using a procedure similar to the one employed by Tunon and Brydges (2006), with some modifications allowing for the shift from dissertation reference list (used by Tunon and Brydges) to annotated bibliography assignment and the overall purpose of the analysis. Specifically, the purpose of the Tunon and Brydges analysis was comparative, while the purpose of this analysis was strictly descriptive.

The citations were gathered from anonymous participant generated annotated bibliographies. Each citation was assigned a unique alpha numeric identifier that included a single letter to identify the annotated bibliography document (A–F for six individual bibliographies) and a number referencing the order the citation appeared in the bibliography. Once the citations were categorized, each citation was scored according to both rubrics. In addition to scoring each citation separately, a compiled score was generated for each annotated bibliography by computing the mean scores of the citations included in the bibliography. SPSS version 19 was used to provide descriptive

statistics on the citations and bibliographies, and the results are reported in the next section.

Qualitative data sources focus on narrative reflections in the form of participant narrative responses to questions designed to elicit reflective feedback. The qualitative data was analyzed with a grounded theory approach (Glaser and Strauss 1967) to explore themes and develop core variables to describe students' experiences with the embedded librarian, which includes instructional content and the prolonged presence of a librarian within the course. Analysis was facilitated by the use of the software, NVivo9. NVivo was useful for creating first level codes and querying the coded data to facilitate the development of patterns and themes. Participants were asked to respond in writing to the following questions:

- What role did the librarian (who offered instructional support and assistance) play in your process of completing the annotated bibliography assignment (describing research questions, refining your question, searching for literature, and finally evaluating and synthesizing the literature)?
- In what ways/How did your prior experiences in clinical research and literature searching influence your completion of the annotated bibliography assignment and use of the embedded librarian support?

Reflections were submitted to the course instructor in writing, de-identified, and forwarded to the researcher for analysis. One of the benefits of having the participants respond in writing is that the data did not require transcription and subsequent member checking to determine accurate representation.

While most of the data collection strategies focused on describing the learners' experiences with the embedded librarian, it was important to consider the course instructor's perspective to provide a holistic description of the embedded librarian project. A post-implementation, semi-structured interview was conducted to provide qualitative feedback. The interview was conducted face-to-face, recorded electronically, and transcribed. To follow qualitative research validation protocol, the interview transcript was sent to the course instructor for member checking. The transcript was coded using an open approach and analyzed thematically. Informal field notes were used in order to document the experiences of the librarian/researcher. Notes were organized by week and recorded in a Web-based document tool, Google Docs.

All data, quantitative and qualitative, were analyzed and triangulated to evaluate the success of the embedded librarian program and describe the experience. Analysis (including development of first and second level codes and thematic analysis) of the participant reflections was discussed and verified with an external qualitative researcher to increase validity.

TABLE 2 Instructional Material Access

Resource Name	Times Accessed
VPN Installation Video	2
Library Help	2
OnMed LibGuide	7
Refworks Handout	6
Refworks Elluminate	0
Searching Ulrich's	7
Peer Review & Ulrich's	9
JCR Video	4
ERIC Demonstration	11
MeSH Demonstration	7
Search Support	6

FINDINGS

Quantitative Results

Seven students were enrolled in the eight-week course, some of whom availed themselves of the embedded library resources and provided feedback. While direct interaction with the students was limited (one question was received, and it came during the last week of the course), analysis of the Moodle access log data shows that the instructional elements were viewed, in many cases multiple times by the same individuals. Table 2 displays the access information for the library content. The most heavily viewed resources included the ERIC demonstration (11 views), the peer review and Ulrich's resource (9 views), the MeSH demonstration (7 views), and the OnMed Libguide (7 views).

The descriptive statistics for the pre-test scores shown in Table 3 indicate that the most frequently occurring confidence value is 2.0, demonstrating that, for all 14 Likert-scale questions, respondents fell between not confident and neutral, with a high level of variance in scores (.850). Post-test scores demonstrated a much lower amount of variance (.216) and a mode falling between confident and very confident. The null hypothesis for the paired t-test was that the pre-test and post-test means were equivalent, and the alternate hypothesis showed the pre- and post-test means were not equal. Results indicate that there was a significant difference in the scores for the pre-tests ($M = 3.06$, $SD = .92$) and post-test scores ($M = 4.23$, $SD = .46$);

TABLE 3 Pre-Post Assessment: Descriptive Statistics

Participant	Test	n	Mean	Δ Mean	SEM	Median	Mode	SD	Variance	Range
1	Pre	7	2.214	.714	.3176	2.000	1.0	1.1883	1.412	3.00
	Post	7	2.928		.2864	2.500	2.0	1.0716	1.148	3.00
2	Pre	7	3.5714	1.143	.2716	3.500	3.0	1.0165	1.033	3.00
	Post	7	4.7143		.1252	5.000	5.0	.46881	.220	1.00
3	Pre	7	2.2143	2.643	.3805	2.000	2.0	1.4238	2.027	4.00
	Post	7	4.8571		.0970	5.00	5.0	.36314	.132	1.00
4	Pre	7	3.357	.859	.3722	4.00	4.0	1.39286	1.940	4.00
	Post	7	4.4286		.2020	5.00	5.0	.75593	.571	2.00

Key: 1= Not Confident, 2= Somewhat Confident; 3=Neutral, 5= Confident; 5=Very Confident, N=number of questions

($t(13) = -7.17, p = .000$). Due to the p value, the null hypothesis is rejected, meaning the pre-test means did not equal the post-test means. Statistically significant results indicate an increase in information literacy self-efficacy as measured by the assessment.

In addition to performing statistical analysis for the mean scores of all participants for each Likert item, a mean score (for all the Likert items) was calculated for each participant. The descriptive statistics for pre- and post-tests for each participant are illustrated in Table 3, while Table 4 illustrates the paired t-test data. Data indicates that in all cases there was a positive increase between the pre and post-test and the exact change in mean scores ranges from .714 to 2.65.

In an effort to evaluate self-efficacy, the assessment also contained items requiring participants to utilize library resources to complete various tasks. Participants were asked to locate electronic access to a specific journal title and specify the dates available, use a database of their choosing to find an article on blended learning in undergraduate medical education, and use the library catalog to find a book in electronic format. The performance results for the first question regarding electronic access to a journal indicate that there was a 33.4% increase in correct responses between the pre and post assessments.

Pre-test results from this question "Using the library catalog find an electronic book on the topic of blended learning" demonstrated reliance on

TABLE 4 Pre-Post Assessment: Pair T-Test

Test:	n	Mean	SEM	Median	Mode	SD	Variance	Range
Pre-test	7	3.058	.2464	2.875	2.0	.9221	.850	3.17
Post-test	7	4.232	.1242	4.375	4.5	.4647	.216	1.75

Key: 1= Not confident, 2= Somewhat Confident; 3=Neutral, 4= Confident; 5=Very Confident, N=number of questions

TABLE 5 Citation Analysis: Summary

Bibliography ID	Objective Rubric Score	Subjective Rubric Score
A	2.75	17
B	2.79	18
C	2.9	20
D	2.85	17
E	2.87	19
F	2.85	17
Mean	2.835	18

general sources including Google Scholar with no mention of the use of subject headings. In the post-test, all respondents indicated that they used a library database, and two mentioned the use of subject headings (MeSH), demonstrating improved search performance. The final performance item required participants to use the library catalog to find an ebook on a specific topic (blended learning), and all participants were able to complete this task satisfactorily in both the pre- and post-implementation assessments.

The citation analysis used two validated rubrics to assign a numerical value to citations based on specified criteria. Analysis of the citations from the annotated bibliography indicated that students used high quality sources. Both objective and subjective scores for all bibliographies were relatively high. Objective scores ranged from 2.75 to 2.9 (3.0 was the maximum score) and subjective scores ranged from 17 to 20 (out of a total of 20 points available). See Tables 5 and 6 for a summary of citation scores and a breakdown of the descriptive statistics. Almost all citations used in the annotated bibliography assignment were from peer-reviewed publications, and the primary variance in the citation categories was in the currency of the

TABLE 6 Citation Analysis: Descriptive Statistics

Statistics	Objective Rubric (n=7)	Subjective Rubric (n=7)
Mean	2.835	18.00
SEM	.0224	.5164
Median	2.850	17.50
Mode	2.85	17.00
SD	.0550	1.265
Variance	.003	1.600
Range	.15	3.0
Legend	Out of 3.0 points	Out of 20 points

articles. When the bibliographies were analyzed with the subjective rubric criteria, the primary areas of variance included the currency of articles and the relevancy to the research question.

Qualitative Results

PARTICIPANT REFLECTIONS

All participants completed reflections, and the reflective data was analyzed for themes to develop a theory of how the presence of a librarian influenced participants. To increase validity, an external researcher verified that the data analysis procedure was appropriate and voiced no dissent with either the first and second level codes or themes that emerged from the data.

An analysis of participant reflections revealed several major themes, including: the nature of the annotated bibliography assignment and critical analysis required in the annotations, use of the library instructional materials, the literature search process in general and specifically the search terms and strategies used within the process, and the process of finding useful and relevant articles.

Annotated Bibliography and Critical Analysis. A number of the responses discussed the nature of the annotated bibliography assignment and strategies used to approach the assignment. While the concept of an annotated bibliography was foreign to many of the participants, the intent of analysis and synthesis of the research was familiar, and participants compared the process to familiar tasks such as writing a literature review for an article manuscript. In addition to strategies regarding the annotated bibliography assignment, participants commented on the critical analysis aspect of the assignment stating how the analysis of articles influenced their decisions and research.

Library Instructional Materials. One of the prevalent themes in the reflections was the customized library instructional content. Librarian-created instructional videos were mentioned in all participants' reflections with generally positive remarks. A minor theme associated with the instructional content was the reduction of search anxiety as a result of viewing the materials. One comment in particular highlighted a reduction in search anxiety after viewing the library instructional content: "Overall, I definitely experienced much less anxiety about the literature search with a good research question in hand and with a few of the tips I picked up from the instructional tutorial on annotated bibliographies" (OnMed reflections, lines 122–126).

A significant theme within the reflections concerns the use of search terms and construction of search strategies. While some participants voiced experience and confidence with their literature searching ability (literature searching in general, not necessarily the use of search terms to construct

search strategies), others expressed a lack of confidence and anxiety about the search process. To further complicate matters, some participants expressed both sentiments in the same reflection. One particularly enlightening comment related that while the participant was comfortable with searching for clinical literature, searching for educational literature was different and introduced a certain level of anxiety: “The experience as a clinician and literature searching tricks were helpful, however, when you branch into a new field of vocabulary and research I felt lost especially when it feels abstract in addition to new territory of design and methods” (OnMed reflections, lines 161–164).

Finding Useful and Relevant Articles. The final major theme uncovered is related to the literature search process in general and is also a component of critical analysis. One of the final steps in the literature search is the ability to not only find results, but to find results that are both useful and related to the topic in question. Several participants commented on this topic, and the relevance of citations to the research topic was one of the subjective criteria in the citation analysis. One particularly interesting comment describes the difficulty of finding relevant articles as a function of the massive increase in scholarly publications in recent years: “literature on it [my research topic] has literally exploded so it is hard to sort through what is relevant and what is not” (OnMed reflections, lines 49–50).

Themes from the instructor interview include an emphasis on the quality of participant annotated bibliographies, the use of library instructional materials, limited interaction between the students and librarian, and finally the literature search capabilities of the participants.

INSTRUCTOR REFLECTIONS

Quality of Participant Annotated Bibliography Assignments. In discussion of the quality of student assignments, the instructor commented: “I was pleasantly surprised with the majority of the products that were produced” (instructor interview, lines 22–23), and “I felt that if I was to compare the product, the annotated bibliography products I think that they were more on par with what I would see from a first year doc student rather than what I see from masters students” (instructor interview, lines 23–25).

Library Instructional Materials. Comments regarding the instructional materials describe the quality of the learning objects: “I think the materials that you developed were not just instructionally sound from a librarianship perspective, but also from an instructional design perspective” (instructor interview, lines 14–16). When the interviewer/librarian researcher noted that the log data indicated usage of the instructional materials, the instructor supported that observation: “Students did use the resources” (instructor interview, line 353).

Limited Interaction Between Students and Librarian. Another theme to emerge from the post-course interview concerned interactions between the embedded librarian researcher and the course participants. Specific comments that support this theme include: “I was assuming that many of the students also had issues of interface [with librarians] and that students were not interfacing and that at a minimum they would begin to establish relationships [with the librarian] on their own” (instructor interview, lines 19–21) and “I’m not sure again because of the limited interaction of the course, because of how much they interacted with the embedded librarian and I don’t think that’s a proxy of the embedded librarian, I think that’s a consequence of the low enrollment” (instructor interview, lines 343–345). The theme of limited interaction is further analyzed in the discussion section.

Literature Search Capabilities of the Participants. In a discussion of faculty literature search patterns, the course instructor commented: “I think like many other faculty members I struggle to try to figure out when I should be interfacing with the academic librarians myself and probably as guilty as the next person of underutilizing and being over confident in my abilities to appropriately search” (instructor interview, lines 7–10).

Many of the themes uncovered in analysis of the interview data are related to the influence of the embedded librarian on the course participants, but an important consideration in an embedded librarian project is the collaboration between the course instructor and librarian. The librarian researcher took the opportunity when interviewing the instructor to elicit feedback regarding not only the collaboration during this embedded librarian project, but also future collaborations between teaching faculty and academic librarians. Further discussion of this theme will be used to triangulate the case study data in the next section.

DISCUSSION

In a mixed methods case study, the diversity of data (both sources and types) require that the data be triangulated to construct and support working theories concerning the librarian’s influence (Yin 2009). Of the four types of triangulation discussed by Patton (2002), triangulation of data sources was conducted in this study because all the data is aimed at corroborating the impact of the embedded librarian. Primary data sources include Moodle access log data, pre- and post-test scores, citation analysis data, and reflective data. Additionally, the instructor interview and librarian researcher’s informal observations (documented in a Google docs log) assisted with data triangulation and served as check points to inform the findings.

Moodle log data supports the reflective data concerning library instructional materials, and both sources indicate that learners accessed the materials. Participants commented specifically on their use of the library

instructional videos: “I did use the brief educational segments by the librarian . . . about ERIC, etc” (OnMed reflections, lines 35–36), which is demonstrated by the number of times the materials were accessed. As an additional data point, the course instructor’s perspective regarding the instructional content is consistent with both the log data and the narrative reflections. Additionally, the instructor reflected upon not only the use of the instructional materials, but their quality and the idea that they were instructionally sound: “I think the materials that you developed were not just instructionally sound from a librarianship perspective, but also from an instructional design perspective” (instructor interview, lines 14–17). It is evident from analyzing both data sources (Moodle log data and participant reflections) that the instructional content was utilized, and this observation was supported by the course instructor.

By analyzing the pre- and post-test results, it was determined that prior to the embedded librarian experience, information literacy self-efficacy scores were comparatively low contrasted to the post-test scores (the pre-test scores ranged from 2.21 to 3.57 where post-test score ranges from 2.9 to 4.7), which reflects moderate confidence in information literacy skills. On average, the difference between pre-test and post-test scores was 1.17. This quantitative data outcome is supported by the participant reflections as several commented specifically on low searching confidence and/or anxiety with literature searching: “I find the literature search quite daunting” (OnMed reflections, lines 110–111). Post-test results that demonstrate increased confidence is supported by the findings from the citation analysis, which indicate that participants used high quality peer reviewed sources.

An additional theme from the data analysis concerns the literature search process, specifically, difficulties in locating relevant articles. Several participants commented that: “The biggest challenges I had with this assignment was finding literature on electronic medical records relevant to my research” (OnMed reflections, lines 49–50), and this was observed in the subjective citation analysis results, as some citation lists received 3 out of 4 points for article relevancy.

Scores for the citation analysis (both objective and subjective measures) were consistently high, demonstrating that the participants used high quality sources in their annotated bibliography; however, it is not possible to correlate the high quality bibliographies with the embedded librarian or any other single factor. The course instructor also noted the high quality of student submissions and suggested that students’ status as experienced academic health care professionals is one possible explanation (instructor interview, lines 23–25; 353–358). One of the citation analysis criteria is related to the type of resource cited, with peer reviewed articles receiving the highest point value. The library instructional content directly addressed this, as one of the videos demonstrated how to use a tool to determine the peer review status

of a publication. Student reflections commented on the usefulness of that specific video, which provided further empirical evidence to support the usefulness of the embedded librarian.

While the research question focused on the embedded librarian experience from the students' perspectives, the variety of data (including the instructor interview and librarian researcher's field notes) lent itself to additional findings related only tangentially to participant experience. One of the significant findings related to faculty collaboration for course integrated and embedded instruction. The course instructor supported collaborations and made recommendations for future collaborations:

but I don't think it would be unreasonable to potentially assign folks to specific courses. Maybe not in the context we're talking about a course of seven people, but what about for large courses, for pharmacy for dentistry, medicine and not just online courses, but face to face courses. If anything you could collaborate with the instructor and strengthen their materials (interview, lines 239–243).

Related to faculty library collaboration is the idea of creating customized library instructional content. Content in the OnMed embedded librarian case study was created specifically for academic health faculty researching clinical as well as educational topics. Without the collaboration between librarian and course instructor, access to the course syllabus and content may not have occurred as early in the design process, if at all.

Collaboration with the course instructor and a detailed review of the course content allowed the librarian to capitalize on knowledge of both the subject matter and the course content as well as information science centric domain knowledge. An example of the benefit of librarian/instructor collaboration is demonstrated in the post course interview. A discussion of levels of evidence and the hierarchical nature of publications turned into a discussion of primary versus secondary sources and led to the instructor's recognition of the necessity of reinforcing that concept for students.

Primary findings relate to the positive impact the embedded librarian had upon participant information literacy self-efficacy, the "presence" or lack thereof of the embedded librarian (specifically relating to interactions with the librarian), and faculty librarian collaborations. Presence in the context of an embedded librarian refers to the prolonged availability of the librarian within the course and interactions between the librarian and learners (Dugan 2008; Hall 2008; York and Vance 2009). Interaction in the general sense of an online course refers to the various types of interactions in a distance or online course described by Michael Moore (1989). Each of these specific themes will be discussed in relation to the literature after a discussion of the broad theme of the online embedded librarianship literature and the findings of this case study.

Best practices described in York and Vance's (2009) review of librarians embedded into online courses focused on linking the librarian with the CMS (course management system), careful selection of courses in which to embed the librarian, active librarian participation in the course, and marketing the service to other faculty members. Many of these recommendations were integrated into the design of the embedded librarian implementation developed for the OnMed course, thus providing additional supporting evidence for the usefulness of York and Vance's literature analysis recommendations.

In order to investigate the efficacy of various levels of course level embedding, Bowler and Street (2008) designed several experimental face-to-face embedded librarian instances with differing levels of integration. The researchers found that a higher level of librarian integration with more student interaction with the librarian resulted in a significant improvement in student scores on a standardized information literacy rubric. The Bowler and Street findings indicate that a high level of integration and presence is preferred; however, the research was conducted in a traditional face-to-face classroom, and the extendibility of these findings to online courses has yet to be investigated. Despite this difference in setting, these results do not support the findings in the OnMed case, which indicate that presence is not as influential as customized instruction.

The Lillard et al. (2009) embedded librarianship implementation served a dual purpose: to prepare library and information graduate students (nascent librarians) to serve as online embedded librarians and to investigate embedded librarianship in online graduate nursing courses. The authors found that the experience was generally positive for the student embedded librarians, graduate nursing students, and faculty. Key conclusions from this project reinforce York and Vance's (2009) recommendations regarding course selection and collaboration.

Feedback from the nursing students enrolled in courses with embedded librarians indicates that the usefulness of the embedded librarian was related to the course topic and where in the curriculum the course occurred. Several students commented that the instruction and embedded librarian experience would have been more beneficial if it had occurred earlier in their program (Lillard et al. 2009). These findings could inform findings from the OnMed embedded librarian case. While the EDG 6931 course occurred relatively early in the OnMed curriculum (in the second semester) and the Lillard findings suggested that early placement is beneficial, students' status as experienced health care professionals could have influenced their use of the embedded librarian. Their prior experience provided them with more opportunities for library instruction, and the practice of evidence-based medicine provided opportunities to apply information literacy skills emphasized by the embedded librarian. The "experience factor" involved with the OnMed students was also noted by the course instructor when he commented that the level of work they produced was similar to that of first semester doctoral

students rather than beginning Masters students (instructor interview, 23–25; 353–358).

Data from the library student reflections in the York and Vance (2009) study indicated their experience as embedded librarians was directly related to the amount of communication between themselves and the faculty instructor and the freedom of communication allowed between the librarian and nursing students enrolled in the course. Clearly in the York and Vance instances of embedded librarianship, the experience of the “librarian” and the overall “presence of the librarian” in the courses were influenced by interactions with the students. The issue of librarian presence within the course and interaction with the students was a key finding for the OnMed study and warrants further investigation.

IMPLICATIONS

Results and implications in this study inform practice in several areas and are discussed in terms of Kirkpatrick’s Evaluation Model (Kirkpatrick 1959). The Kirkpatrick Model was developed in the 1950’s by Donald Kirkpatrick to evaluate training programs and includes four evaluation levels (Kirkpatrick 1959a; 1959b; 1960a; 1960b). Level One is the most basic and assesses the learners’ reactions to the training; Level Two assesses learners’ knowledge gained as a result of the training; Level Three assesses the extent to which the training influenced learners’ subsequent behavior; and Level Four assesses outcomes and results based on the training. The four levels can be thought of in a hierarchical manner with Level One at the bottom and Level Four on top. Kirkpatrick’s Evaluation Model was selected for this project particularly because it is a commonly used model (Alliger and Janak 1989; Cascio 1987) that may resonate with stakeholders interested in the results of this study. Implications are categorized broadly into three areas: implications for the practice of librarianship, administrative and policy implications, and educational and curricular implications. Of these three areas, implications for professional practice is the most relevant to library science outside the specific context of the University of Florida Health Science Center and is discussed in detail. Administrative and policy implications relevant to academic librarianship are also described.

Implications for Academic Librarianship

Findings from this and other studies support the efficacy of embedding librarians into online courses (Bowler and Street 2008; Edwards, Kumar, and Ochoa 2010; Lillard et al. 2009; York and Vance 2009; Shumaker and Talley 2009). However, the findings highlight the necessity of careful consideration

of the course and audience prior to initiating an embedded librarian and during the designing of the embedded librarian content. Prior to planning and implementing an online embedded library program, librarians must carefully consider the curriculum to select appropriate courses, collaborate closely with instructional faculty, and employ an instructional design plan that includes a thorough needs assessment. It is imperative that the design of the embedded library content, including instructional materials and interactions, be tied to the needs of the learners and the course. For example, an entry level online undergraduate course that was designed to be highly interactive may require more “presence” from an embedded librarian than an online graduate course with highly experienced learners.

In order to maximize student impact while balancing the time investment necessary for embedded librarian projects, librarians should work closely with the course instructors to assess the needs of the course and learner characteristics prior to implementing an embedded librarian program that features interaction with the librarian. In addition to careful course selection and instructional design, librarians embedding themselves in online courses should familiarize themselves with strategies used to increase learner interactions and best practices for establishing an online teaching presence.

Implementing the recommendations above will help to make the embedded librarian design and development process more efficient and effective; however, there is still an intensive time commitment required. There is the potential for librarians to be overwhelmed with meeting the needs of students enrolled in the course with an embedded librarian and balancing other responsibilities. For example, in one instance of an embedded librarian in the HSC library, the librarian is integrated into the foundational course for the online professional program in the college to which she liaises. The librarian interacts with students in the foundational course but is also responsible for supporting the needs of the entire program (approximately 600–800 students) and the college at large, which includes several other large programs in addition to the faculty members. Given the large number of potential users this liaison librarian supports, a high level of involvement in the course in which she is embedded can be overwhelming and lead to increased stress and potentially decreased effectiveness. The conditions in which a librarian can successfully embed in a course and the degree of integration must be determined by the librarian, library administration, and the faculty and administration in the college and/or program in which the embedding will occur.

In addition to these recommendations for practicing librarians, the study has implications for the education of practicing and future librarians. Embedded librarianship as demonstrated in this study (librarians embedded into courses or the curriculum) requires a set of skills that the librarian researcher, but not necessarily all academic librarians, possesses including knowledge of instructional design models, learning theories, and educational

technology. Steven Bell and John Shank (2004) describe librarians with these skills as “blended librarians.” A blended librarian is: “an academic librarian who combines the traditional skill set of librarianship with the information technologist’s hardware/software skills, and the instructional or educational designer’s ability to apply technology appropriately in the teaching-learning process.” Academic libraries are acknowledging this need by actively recruiting librarians with these skills. An analysis of position advertisements demonstrates that fewer than twenty-four library job announcements in 2003 used the phrase “instructional design/er” and of that total there were only ten announcements that were not reposting earlier advertised positions (Shank 2006). The Shank study analyzes the knowledge, skills, and abilities described in the position descriptions to define key characteristics for librarians whose primary responsibilities focus on educational technology and instructional design. In seeking to hire instructional technology librarians and reference and instructional librarians with some instructional design skill, academic libraries are responding to the shifting nature of academic librarianship. Clearly academic libraries recognize the importance of instructional skills, but when, how and where do librarians acquire these skills?

Options for providing these instructional skills fall into two broad categories: educating future librarians and educating practicing librarians. A broad, far-reaching solution involves changes to the graduate school curricula for library and information science programs. An examination of the course listings of the graduate school programs listed by US News and World Report in their “Best Graduate Schools” reveals that, with the exception of media specialist certification requirements, a majority of the Master’s Degree programs do not include instructional design or educational methods courses. As academic librarians are increasingly engaged in designing and delivering instruction, formal preparation in learning theories, instructional design and pedagogy/andragogy would more fully prepare librarians for their instructional roles.

While this is an optimal strategy for library education, curricular changes require large scale institutional adjustments and take time to plan and implement. Therefore, it is important to continue to provide practicing librarians with opportunities to develop and cultivate instructional knowledge and skills. This continuing education can occur at various levels including within the library, on campus, and through regional, national, and international conferences and professional organizations. Libraries sponsor and facilitate professional development on a variety of topics, which should include quality offerings designed to provide both theoretical and practical knowledge and skills relevant to instruction.

Another source of professional development and support that should not be overlooked includes campus based resources, instructional centers and institutes, similar to the University of Florida’s Center for Instructional Teaching Technology (CITT). UF’s CITT provides faculty with training on a

variety of instructional design and technology topics. In addition to offering training, CITT staff also provides instructional design and development support to produce instructional content. Academic librarians should make use of these local sources of continuing education and professional development, which are often provided at low or no cost to the individual, to enhance their instructional knowledge and skills.

Beyond these readily available, economically feasible continuing education options there are additional sources at the national and international level. Professional organizations, both library and non-library organizations, are an important source of training opportunities. An example of an established, high profile program is the Association of College and Research Libraries' Information Literacy Immersion Program. According to their Web site, the goal of the immersion program is to provide librarians with a training experience designed to supplement their teaching, instructional program planning, reflective teaching and assessment skills—specifically relating to information literacy concepts:

ACRL's Immersion Program provides instruction librarians with the opportunity to work intensively on all aspects of information literacy. Whether your institution is just beginning to think about implementing an information literacy component or whether you have a program well under way, the Immersion Program will provide your instruction librarian with the intellectual tools and practical techniques to help your institution build or enhance its instruction program (ACRL 2006b).

While anecdotal evidence from practicing librarians support the efficacy of these programs, registration fees range from \$1,875–\$1,975 depending upon membership status, and the high cost can be prohibitive. Therefore, it's important for librarians to consider other avenues of continuing education including sessions offered at professional conferences. Conferences offer formal continuing education opportunities in the form of workshops and informal development from conference presentations. In many academic libraries attendance and participation in professional conferences is required or highly recommended and with varying amounts of financial support allotted. By coupling conference attendance with formal and informal continuing education in a conference setting, librarians maximize the time and financial investment required for those activities. Another option for academic librarians serious about gaining instructional design knowledge and skill involves taking credit bearing graduate level course work beyond that required for the library science degree. This can be done through a college of education for either a post-graduate certificate or for an additional graduate degree. Colleges of education, including the University of Florida College of Education, are offering increasing numbers of certificate and Master's degree programs online targeting practitioners.

Findings from this case study indicate that high quality embedded librarian programs positively influence student outcomes, and in order to design and develop successful implementations, academic librarians need to be able to acquire and develop their instructional knowledge and skills, formally and informally.

Policy and Administrative Implications

This study evaluated a single use case of an embedded librarian instance. While results demonstrate benefit to both the students and the instructor, the benefit was limited to a very specific group of users, and the overall impact of the librarian's time and intellectual investment is undetermined. In order to increase the institutional impact of course integrated embedded librarians, similar projects would need to be implemented in other colleges, departments, and programs. In fact, wide-scale campus implementation of course-level embedded librarians was a recommendation resulting from the interview with the course instructor (instructor interview, lines 236–237). While theoretically it may be beneficial to use this model to embed librarians in courses campus wide, the model may not support expansion of that level.

As mentioned previously in relation to this project, and in the embedded librarian literature (Bozeman and Owens 2008; Edwards, Kumar, and Ochoa 2010; Dewey 2004; Dugan 2008; Freiburger and Kramer 2009; Hall 2008; Lillard et al. 2009; Kesselman and Watstein 2009; Matthew and Schroder 2006; Rudin 2008; York and Vance 2009; Shumaker and Talley 2009; Tennant and Miyamoto 2002), embedding a librarian in courses requires a significant time investment from the librarian. Each stage of the instructional design process, beginning with the needs assessment to collaboration with the faculty member and the development of instructional materials, is time and labor intensive, but crucial to the success of the project. In addition to investing time in developing customized integrated instructional materials, a truly embedded librarian will devote time to participating in the course in which they are embedded, including offering support and interacting with the learners and/or instructor.

While librarians may be willing to devote the intensive amount of time to embedding themselves into courses, unless the role of "embedded librarian" is their only function in the library, doing so may limit their ability to perform additional vital functions that support the library and their career, especially in institutions where librarians are tenure-track faculty. There are several potential solutions to this dilemma, designed to help the individual embedded librarian and the library achieve some return on their time and invest in resources necessary to produce a quality, successful embedded librarian product.

One potential solution to this problem is to create instructional materials that are reusable. In this case study, the instructional content developed by the librarian researcher was reused for a similar audience of medical educators and modified and repurposed for other audiences, thus extending the usability of instructional content and expanding the benefit beyond the OnMed embedded librarian project. However, the fact that the instructional materials were ostensibly developed for a specific group can possibly curtail the reusability of the materials so that they are only useful to reuse with a group similar to the one for which they were designed. It may also be feasible to design and develop templates with details and examples based upon a pre-determined framework, which librarians can use to facilitate and hasten the development of instructional materials.

Another solution to extend the benefit of the time investment is to turn the service focused instructional project into a research project by participating in the scholarship of teaching and learning (SoTL). In conducting SoTL research related to the embedded librarian duties, librarians and their institutions can achieve some return on their time investment by disseminating and publicizing library research and supporting retention through the tenure and promotion process.

If an institution or library decides to implement course level embedded librarian programs regardless of the time involved with the endeavor, there may be other less tangible ways to recoup some of the lost investment. Evaluating embedded librarian programs in these terms can be seen as a discussion of return on investment, is an example of a Kirkpatrick Level Four evaluation (evaluating results) (Kirkpatrick and Kirkpatrick 2006) and has direct policy and administrative implications.

FUTURE DIRECTIONS & CONCLUSIONS

Findings from this study, particularly regarding the information literacy self-efficacy assessment, indicate that embedded librarians are beneficial to students and improve their information literacy self-efficacy and skills, primarily through learner-content interactions rather than learner-instructor (or learner-librarian) interactions. The findings may lead to the assumption that individuals are more interested in interacting with library content rather than a librarian; however, these findings may be specific to the learners in this case. In cases similar to this featuring non-traditional learners who may have more prior experience with library research and information literacy concepts, it may be preferable to focus on collaboration with faculty and the creation of customized instructional materials rather than developing rich learner-librarian interactions. Further study is required to test the above assertion.

Additional studies further explore the presence of embedded librarians in online courses. These studies are based in other contexts, both in graduate and undergraduate settings, and were designed to determine whether the preference for learner-content rather than learner-librarian interactions is true of other types of students in other courses. These studies would hopefully make recommendations for strategies to increase learner-instructor interactions in future iterations.

Research concerning communities of inquiry, interaction and presence in online courses, influences librarians' roles as online embedded librarians and is related to and potentially dependent upon what role(s) the embedded librarian plays within the course. For instance, librarians who have more freedom and flexibility with their interactions with students enrolled in the course have more potential for interactions of all types. Librarians who have an instructor-like role within the course will interact with students in a manner similar to the course instructor while a librarian with a less formal role may interact with students in a manner that more closely resembles student-to-student interactions. Future research could focus on investigating librarians' roles in online courses and determining how students interact with librarians and the ways in which librarians affect cognitive presence.

In addition to researching librarian presence, future studies could use other methodologies to further investigate a librarian's impact in online courses, including experimental or quasi-experimental designs with a control group to provide more rigorous empirical evidence of the efficacy of the embedded librarian.

As is demonstrated by the professional literature (Bozeman and Owens 2008; Edwards, Kumar, and Ochoa 2010; Dewey 2004; Dugan 2008; Freiburger and Kramer 2009; Hall 2008; Lillard et al. 2009; Kesselman and Watstein 2009; Matthew and Schroder 2006; Rudin 2008; Schumaker and Tally 2009; York and Vance 2009), librarians are being increasingly embedded or integrated into a variety of contexts including colleges, departments, research teams, and both online and face-to-face courses; it is clear that embedded librarianship is the future of academic librarianship. Embedded librarians are being used to provide contextualized instruction in the increasing number of online courses being offered by institutions of higher education (Allen and Seaman 2011). Evaluation is essential because this is a new service area. The embedded librarian implementation described in this project built upon experiences with a similar pilot project and best practices from the literature including customized instructional content, multiple modes of optional interaction with the librarian, and extensive faculty support and collaboration. However, this project extends the literature by using a multifaceted case study methodology to measure impact and explore participants' experience with the embedded librarian.

Both quantitative and qualitative methods were employed including a pre- and post-assessment of information literacy self-efficacy, citation analysis

of student submissions, and participant reflections. A post course interview with the instructor and field notes from the librarian researcher further informed the findings. Results indicated an increase in self-efficacy and high quality annotated bibliography submissions, which are primarily attributed to viewing the instructional content rather than interacting with the librarian.

This project paved the way for future embedded librarian initiatives at the University of Florida and further collaborations between librarians and faculty as well as additional research regarding experiences with an online embedded librarian and librarian presence.

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