A Text Analysis of Four Levels of Librarian Involvement and Impact on Students in an Inquiry-Based Learning Course
Une analyse de texte de quatre niveaux d'engagement des bibliothécaires et de leur impact sur les étudiants dans un cours conçu sur l'apprentissage par enquête

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Résumé de l'article

Des bibliothécaires de l'Université de Calgary ont collaboré avec des professeurs dans le cadre d'un cours conçu sur l'apprentissage par enquête en participant de façons variées dans quatre sections de cours. Cette étude utilise l'analyse textuelle des travaux étudiants pour évaluer le développement des compétences informationnelles selon quatre niveaux de participation : bibliothécaire en tant que formateur principal, deux niveaux de bibliothécaire intégré et une formation unique et ponctuelle. La méthodologie comprenait le suivi des mots-clés générés en utilisant le Référentiel de compétences informationnelles en enseignement supérieur de l'ACRL et l'analyse textuelle des travaux de réflexion des étudiants dans un cours de première année de premier cycle conçu sur l'apprentissage par enquête et axé sur la recherche. Les résultats suggèrent que l'amélioration des compétences informationnelles des étudiants n'est pas liée à la quantité d'enseignement offert par un bibliothécaire, mais plutôt au niveau d'adhésion du professeur par rapport aux services de la bibliothèque et à l'importance des compétences informationnelles. Nous soutenons que l'implication la plus efficace du bibliothécaire est celle de consultant de cours sur les compétences informationnelles plutôt que celle du bibliothécaire intégré à temps plein (ce qui est surprenant compte tenu de la recherche sur l'efficacité du modèle du bibliothécaire intégré). Bien que d'autres recherches soient nécessaires, les résultats de cette étude ont des implications importantes pour les pratiques d'enseignement et les collaborations sur le contenu des cours avec les professeurs.

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Abstract / Résumé

Librarians at the University of Calgary collaborated with instructors on an inquiry-based learning course with varying involvement across four course sections. This study uses text analysis of student assignments to assess information literacy (IL) skill development across four levels of course participation: librarian as instructor-of-record, two levels of embeddedness, and a single one-shot session. The methodology included the tracking of keywords generated using the ACRL Framework for IL and text analysis of student reflection assignments in an inquiry-based, research-focused first-year undergraduate course. The results suggest that the benefit to student IL skills is not related to amount of librarian instruction, but rather to the level of instructor buy-in with regard to library services and the importance of IL skills. We argue that the most impactful librarian

involvement is as an IL course consultant rather than a full-time embedded librarian (which is surprising given the literature on the efficacy of embeddedness). Although further research is needed, the study results have significant implications for academic librarian instructional practices and collaborations on course content with faculty members.

Des bibliothécaires de l'Université de Calgary ont collaboré avec des professeurs dans le cadre d'un cours conçu sur l'apprentissage par enquête en participant de façons variées dans quatre sections de cours. Cette étude utilise l'analyse textuelle des travaux étudiants pour évaluer le développement des compétences informationnelles selon quatre niveaux de participation : bibliothécaire en tant que formateur principal, deux niveaux de bibliothécaire intégré et une formation unique et ponctuelle. La méthodologie comprenait le suivi des mots-clés générés en utilisant le Référentiel de compétences informationnelles en enseignement supérieur de l'ACRL et l'analyse textuelle des travaux de réflexion des étudiants dans un cours de première année de premier cycle conçu sur l'apprentissage par enquête et axé sur la recherche. Les résultats suggèrent que l'amélioration des compétences informationnelles des étudiants n'est pas liée à la quantité d'enseignement offert par un bibliothécaire, mais plutôt au niveau d'adhésion du professeur par rapport aux services de la bibliothèque et à l'importance des compétences informationnelles. Nous soutenons que l'implication la plus efficace du bibliothécaire est celle de consultant de cours sur les compétences informationnelles plutôt que celle du bibliothécaire intégré à temps plein (ce qui est surprenant compte tenu de la recherche sur l'efficacité du modèle du bibliothécaire intégré). Bien que d'autres recherches soient nécessaires, les résultats de cette étude ont des implications importantes pour les pratiques d'enseignement et les collaborations sur le contenu des cours avec les professeurs.

Keywords / Mots-clés

information literacy (IL), librarian-instructor collaboration, academic librarianship, inquiry-based learning (IBL), librarian as instructor, scholarship of teaching and learning (SoTL)

compétences informationnelles, collaboration bibliothécaire-professeur, bibliothéconomie universitaire, apprentissage par enquête, connaissances en enseignement et apprentissage

Introduction

Librarians at the University of Calgary have been collaborating with the Taylor Institute for Teaching and Learning on its inquiry-based learning (IBL) course offerings for several years. UNIV 201: Global Challenges is an IBL course introducing and building student-directed research skills for new undergraduates. The vision of UNIV 201 reflects evidence-based advances in theSscholarship of Teaching and Learning (SoTL), which is a major research focus within the Taylor Institute for Teaching and Learning. Librarians at the University of Calgary are also actively engaged in SoTL, which not only

informs librarian teaching practices but is also one of the ways University of Calgary librarians contribute to the progress of teaching practices in higher education.

UNIV 201 students tackle a global challenge such as food or water security, poverty, gender discrimination, child health, or racial conflict, researching and working together in small teams to arrive at a solution to the challenge. Through the IBL framework, students are encouraged to take multiple perspectives, approaches, and strategies to the global issue. Content is presented through "instructional practices designed to promote high order intellectual and academic skills through student-driven and instructor-guided investigations" (Justice et al., 2009, p. 843).

The University of Calgary Libraries and Cultural Resources and its librarians have been collaborative partners in these courses and have previously written on reflections and strategies for positive involvement with inquiry-based learning courses and teaching and learning departments (Murphy et al., 2020). A necessary further step of this research has been to "explore a comparison of inquiry-based course sections with varying librarian involvement" (Murphy et al., 2020, p. 17), in order to quantify the impact of librarian participation.

In Fall 2019, the authors were able to continue this exploration when one of the librarian team members had the opportunity to instruct a section of UNIV 201. This provided a varied set of librarian involvement across the course sections, including librarian as instructor-of-record, one section with a one-shot instructional session and two levels of embedded librarian, partial and full (Olivares, 2010). This article builds on previous findings and aims to explore the following question: how is the frequency of certain terms in student assignments, a suggested indicator of development of IL skills, reflected across four course sections with varying librarian involvement?

Noteworthy aspects of the study include that (1) the results suggest course consultation is more effective than direct instruction, (2) the method (text analysis) is rarely applied in this LIS research study context, and (3) the study leveraged the opportunity to compare IL instructional efficacy between librarian and non-librarian instructors teaching the same content in a full-term course.

Literature Review

Librarians as Instructor of Record

Librarians occasionally have the opportunity to teach a course section as the instructor of record. According to the University of Calgary's collective agreement, an instructor of record is a member of the university's academic staff teaching a course offered for degree credit (University of Calgary, 2019).

There are a few but not many discussions of librarian as instructor of record in the literature. Shelley (2018), an academic librarian, taught a graduate music research course as instructor of record, describing the experience as being the most rewarding and challenging of her librarianship career. In another case, an engineering librarian

taught a section of a first-year engineering course on evidence-based decision making (Van Epps, 2013). Librarians have also taught one-credit seminar courses such as studying literacy works (Harnett et al., 2018).

Beyond these few examples, there is limited literature discussing librarians as instructors of record, and especially assessments of student learning in those contexts.

Embedded and Single Session Instruction

As is the case in many academic institutions, librarians at the University of Calgary have been embedded into instruction, faculties, and departments for many years (Clyde & Lee, 2011). There are many examples in the literature on the successful embedding of librarians into academic coursework (e.g. Pati & Majhi, 2019; Brower, 2011), with benefits including: encouraging students to become lifelong learners (Bowles-Terry & Donovan, 2016); improved impact on IL skills compared to single instructional sessions (Tang & Tseng, 2017); better performance on student assignments (Heathcock, 2015); stronger relationships between students and librarians (Hoffman et al., 2017); and overall positive effects on student learning (Schulte, 2012). Moreover, embedded librarianship is not merely a phenomenon in university courses. Librarians have been embedding themselves in other institutional contexts, including law firms, hospitals, and professional centres (eg. Kavanaugh & Lenart, 2017), all of which contributes to the fluidity of the professional identities of librarians (Klein & Lenart, 2020).

Elmborg (2006) has stated that teaching IL should help students build critical awareness of the context and place of information in their academic work in addition to practical navigational skills. Embedded librarianship typically allows more time for librarians to promote this awareness through repeated librarian-student interactions (Hoffman et al., 2017).

How embedded a librarian is in a course or program varies. Olivares (2010) defines two levels of embeddedness: partial (or sufficiently) and full. Full embeddedness includes the librarian in the daily operations of a department or attending all (or nearly all) classes of a course. This relationship may take years to achieve, and a librarian may only be partially embedded at first (Olivares, 2010). As defined by Kesselman and Watstein (2009), fully embedded librarians are "first and foremost, integrated into their settings, be they traditional or nontraditional" (p. 387).

The embedded model contrasts with the frequently discussed single, or one-shot, library session. Despite being a popular teaching method in academic libraries, the single library session has been criticized for being insufficient for students' needs (Walker & Pearce, 2014) and difficult to assess (Wang, 2016).

Faculty-Librarian Collaborations

In a systematic review of emerging roles for librarians, much of the included literature explores teaching from the librarian perspective, stressing the importance of collaboration with teaching faculty and indicating that librarians are still experimenting

with their embedded roles in curriculum (Vassilakaki & Moniarou-Papaconstantinou, 2015).

Although much literature explores instruction from the librarian perspective, recent research indicates how faculty and students view librarians on campuses "Both faculty and student perspectives are driven by where their work intersects with that of librarians. A seeming increase in library instruction might have improved the visibility of librarians as educators in the minds of faculty and students" (Fagan, et al., 2020, p. 30).

If an institution does not have a formal policy linking IL programming into teaching and learning goals, it is often up to individual librarians to foster relationships with faculty to facilitate their presence in courses (Lindstrom & Shonrock, 2006). Successful collaboration between librarian and instructor requires "shared understood goals; mutual respect, tolerance, and trust; competence for the task at hand by each of the partners; and ongoing communication" (Ivey, 2003, p. 102).

Although the instructor typically sets the course learning outcomes and assessment, embedding a librarian into the course can add another resource for students and create a peer mentorship relationship between instructor and librarian (Bene & Murphy, 2021). This collaboration is of professional benefit to both parties and enhances student learning.

Librarian Involvement in SoTL

Participation in the Scholarship of Teaching and Learning (SoTL) can assist librarians in the development of their instructional skills and identity as instructors (Hays & Studebaker, 2019). This is especially necessary as many academic librarians may have had limited coursework on instruction in their library degrees (Houtman, 2010; Walter, 2008). McClurg et al. (2019) have suggested four models of librarian engagement in products of SoTL: consultant, developer, partner, and scholar. Using this framework to determine an appropriate level of engagement for UNIV 201 could dissipate some of the role confusion and build clarity for librarians, instructors, and students.

Pritchard (2010) explained how librarians could increase understanding of their roles: "it is not enough to simply view ourselves as professional colleagues with important knowledge and expertise to contribute. We need to be able to define it for ourselves and clearly communicate it to faculty" (p. 388). Librarians should continue to advocate for inclusion in planning, syllabus and assignment design, and assessment for IBL courses. This early involvement would maximize student IL skill outcomes and optimize librarian-instructor collaborations.

Text Analysis and Assessing IL via ACRL

In the *Encyclopedia of Measurement and Statistics*, Salkind (2007) defines text analysis "as a research technique designed to make systematic and replicable inferences from texts.' "Text analysis constitutes a variety of social science research methods designed

to ascertain meaning and bring structure to large amounts of unstructured information derived from different acts of communication embodied in written language" (p. 999).

In the library and information science (LIS) literature, text analysis has been used to analyze LIS job postings (Durr, 2020; Maceli, 2015); plagiarism software detection (Vani & Gupta, 2018); classification methodologies (Moohebat et al., 2015); faculty publication trends (Gao, 2017); and ebook usage (Bakkalbasi & Goertzen, 2015).

Text analysis has been used in a few instances in the literature in connection with IL. A 2015 study examined LIS student responses as to whether IL content should be expanded in the program (Inskip, 2015). A study from 2017 assessed the development of evidence-based practice in nursing students applying text analysis techniques (Kolstad, 2017). In "A text mining analysis of academic libraries' tweets" by Al-Daihani and Abrahams (2016), a text mining approach was applied to a dataset of tweets by ten academic libraries. An analysis by Timakum et al. (2018) also used text mining and analysis of library science journal articles to identify changes in knowledge trends by applying techniques such as co-word analysis and text summarization.

The Association of College and Research Libraries (ACRL) Framework for Information Literacy has been used to measure IL skills, for example in "Initial Development of the Perception of Information Literacy Scale (PILS)" by Doyle et al. (2019) and "Student, librarian, and instructor perceptions of IL instruction and skills in a first-year experience program: A case study" by Kim and Shumaker (2015). Doyle et al. (2019) developed an instrument, the Perception of Information Literacy Scale (PILS), that measures Framework-based perceptions of IL skills and examines its validity and reliability for use with graduate students. Kim and Shumaker (2015) looked for differences in perceptions of IL instruction and students' IL skills based on role (student, librarian, or instructor) as well as course participation. In both cases, the Framework was applied to questionnaires filled out by participating students and instructors to measure IL skills.

Background

The current study adds to the limited literature assessing IL skill development using text analysis, in an undergraduate student group, across varying levels of librarian involvement, and in inquiry-based learning.

Librarian involvement in the inquiry-based course has evolved over three years of collaboration between librarians and instructors:

- 2017: one librarian embedded in a single course section
- 2018: five librarians embedded in five course sections (Murphy et al., 2020)
- 2019: one librarian teaching a course section; one librarian embedded in two course sections and teaching a single library session in the fourth course section; and a third librarian, uninvolved in teaching, describing the study to students and collecting consent agreements

In Summer 2019, the original partnering librarian applied to be an instructor and was offered the opportunity to teach one section of UNIV 201. Librarians were invited to support the remaining three course sections. This support varied from being fully embedded to a one-shot session. Librarians participated in the course sections as was requested by the instructors. Given the ethical limitations of withholding librarian assistance from a given section in order to generate a baseline that did not involve librarian delivery of IL instruction, this study could not rely on such a baseline for comparison and analysis of results. Table 1 presents the four course sections and the differing contributions of both librarian and instructor in terms of IL student development. For example, IL instruction included searching demonstrations for academic resources, discussions and activities on how to evaluate evidence stemming from both peer-reviewed and popular sources, and library search and database instruction.

Methodology

Reflection Assignments

In UNIV 201, students are required to submit three critical self-reflection assignments throughout the semester:

1. Reflection (Semester Goals & Plans):
   Students explore their motivation, outline their goals, the personal value of their goals, and their plan for how to achieve their goals.

2. Reflection (Semester Progress):
   Students self-assess their growth and progress towards their goals and course outcomes, identify struggles, and develop a plan for the second half of the semester.

3. Reflection (End-of Semester Reflection):
   Students self-assess overall progress by asking themselves questions such as "which parts did you find more challenging" and "what skills, abilities, and concepts will you take away from this course".

To be able to assess student reflections from all four course sections, an ethics approval was acquired (Conjoint Faculties Research Ethics Board, University of Calgary REB19-1332), and a third librarian member of the study team, uninvolved with any of the sections, joined each section's classroom at the end of the semester, after all reflection exercises were completed and graded. The librarian described the study to the students, outlined the goals of the study, and inquired into interest in participating. Students who expressed interest were asked to sign a written consent form. Reflection exercises belonging to students who gave consent were collected from all four instructors after grading was finalized and reflections were anonymized.

In total, 38 assignments were collected in the librarian as instructor section, 34 in embedded librarian section 1, 36 in embedded librarian section 2, and 35 in librarian one-shot instruction section. Reflection assignments that were submitted in another format such as video or audio recordings were not considered for analysis. Although a

quantitative comparison is within the scope of this study, future research could include a statistical analysis of the differences between course sections.

In analyzing the reflection assignments through the semester, the research team saw an opportunity to assess and compare the development of IL skills, indicating both impact of librarian involvement through the term and across course sections. Each section had approximately 20 to 25 students, and although not all students submitted all three assignments and not all students consented to the study, the resulting set of data included 143 assignments for analysis.

Keyword Selection

Since librarians were not involved in the development of course content, there were no assignments or other curricular outcomes that directly tested student IL skills and library service awareness. Thus, the reflective assignments were used as a mechanism for assessing the impact of librarian instruction and involvement through the semester.

The reflection assignments were analyzed using a full-text keyword search. Keywords were selected based on the Framework for Information Literacy for Higher Education (ACRL, 2015) and were developed after all four sections had finished grading. Two descriptive keywords were extracted from each of the six frames of the Framework for Information Literacy for Higher Education: Authority is Constructed and Contextual; Information Creation as a Process; Information has Value; Research as Inquiry; Scholarship as Conversation; and Searching as Strategic Exploration.

The authors selected two keywords highly descriptive of each category and these were used to conduct a pilot keyword search on ten random student assignments by all three authors independently. Following the pilot search, keywords were collaboratively adjusted to represent how undergraduate students might describe these concepts, skills, and competencies. The final twelve selected keywords were: expert, reliable, research, information, source, bias, plagiarism, cite/citation, librarian, library, resources, and critical.

After the initial pilot search, it was determined to specifically exclude "water resource" to prevent misleading search results for the keyword "resource" as one of the main areas of research in this course was water sustainability. "Water resource" was mentioned heavily in the student reflections but had no connection to the word "resource" from an IL point of view.

Text Analysis

The text analysis was conducted with NVivo12 (version 12.6.0) on a MacBookPro 2019 (MacOS 10.15 Catalina). The assignment documents were compiled and converted into PDF files organized by instructor and assignment number (for example: instructor one, assignment one; instructor one, assignment two, etc.).

Documents were searched for the predetermined keywords in NVivo using the "Word Frequency" and "Text Search" functions. The full keyword search query, separated into instructors and student reflection assignments, was: expert OR reliable OR research OR information OR source* OR bias OR plagiarism OR cite OR citation OR librarian OR library OR resource* NOT "water resource" OR critical.

Future research could explore the selection of keywords for text analysis and subsequent representation of IL skill development. This could include phrase searching or keyword searching within the context of the words in the surrounding sentences.

Results

Table 1 displays the overall levels of involvement and subsequent results of the keyword text analysis. Because of differences in assignment numbers for each course section, the average of all keyword search results for each instructor and reflection has been included to provide more evident comparability. The table includes:

1. The varying levels of librarian involvement in the four course sections, from most involved (instructor of record) to least involved (one-shot instruction)

2. Librarian and instructor contributions to IL skill development

3. Keyword search used across all assignments

Table 1
Librarian involvement across four course sections and text analysis search results

Instructor	Involvement		reflection 1	reflection 2	reflection 3	overall
Librarian as instructor *38 reflections submitted*	Librarian: • taught all but one class throughout semester Librarian colleague presented & led discussion in one class (same as one-shot instruction librarian)	**All Keywords:** Individual Keywords: Expert reliable research information source* bias plagiarism cite OR citation librarian library resource* critical	**32 (∅0.8)** 0 0 19 5 8 0 0 1 0 1 5 0	**97 (∅2.5)** 2 4 32 7 20 0 0 1 0 6 13 6	**63 (∅1.6)** 0 2 29 5 2 1 0 1 1 3 4 3	**192 (∅5.0)** 2 6 80 17 30 1 0 3 1 10 22 9

Embedded librarian section 1 *34 reflections submitted*	Librarian: • met with instructor before semester to discuss & plan • attended class nine times • presented or led discussion seven times • added to D2L (institutional online learning platform) & posted to discussion boards Instructor: • discussed IL often and actively with class • integrated IL concepts actively into content • consulted with librarian on how to promote IL • championed IL in class	**All Keywords:** Individual Keywords: expert reliable research information source* bias plagiarism cite OR citation librarian library resource* critical	**62 (Ø1.8)** 0 1 19 11 3 0 0 1 4 1 14 8	**153 (Ø4.5)** 0 5 61 23 22 0 0 1 1 9 21 10	**139 (Ø4.0)** 1 1 62 22 8 0 2 5 3 8 3 24	**364 (Ø10.7)** 1 7 142 56 33 0 2 7 8 18 38 42
Embedded librarian section 2 *36 reflections submitted*	Librarian: • met with instructor before semester to discuss & plan • attended class eight times • presented or led discussion six times • added to D2L and posted to discussion board Instructor: • discussed IL concepts occasionally with class • open to librarian input on IL but relied on librarian to take lead	**All Keywords:** Individual Keywords: Expert reliable research information source* bias plagiarism cite OR citation librarian library resource* critical	**65 (Ø1.8)** 0 0 30 9 4 0 0 0 0 4 17 1	**93 (Ø2.5)** 0 0 31 33 15 0 0 0 0 2 9 3	**85 (Ø2.3)** 0 1 45 19 10 1 0 0 0 2 3 4	**243 (Ø6.7)** 0 1 106 61 29 1 0 0 0 8 29 8
One-shot instruction *35 reflections submitted*	Librarian: • provided one-hour IL session Instructor: • No other collaboration with instructor reported by one-shot instruction librarian.	**All Keywords:** Individual Keywords: Expert reliable research information source* bias plagiarism cite OR citation librarian library resource* critical	**50 (Ø1.4)** 0 0 19 6 0 0 0 1 2 1 20 1	**88 (Ø2.5)** 0 2 32 16 11 0 1 3 1 6 14 2	**46 (Ø1.3)** 0 2 29 3 2 0 0 1 1 3 4 1	**184 (Ø5.2)** 0 4 80 25 13 0 1 5 4 10 38 4

Note. Ø represents the average results normalized to the number of reflections per course section.

The section with the highest number of search results, at 364, was Embedded librarian section 1. The second highest keyword frequency was in Embedded librarian section 2, receiving 243 mentions. The Librarian as instructor section resulted in 192 results while assignments in the ne-shot instruction section had the fewest, at 184 mentions.

The number of mentions increased from reflection assignment one to two in all course sections. This may be due to the assignment description more specifically instructing students to reflect on their research skills development. In all the course sections except one-shot instruction, the frequency of keywords is higher in reflection three than reflection one. This may reflect the development of IL skills throughout the semester.

Discussion

The results of this study suggest that the benefit of librarian instruction to student IL skills does not necessarily increase with the amount of direct contact time the librarian has with students. The results suggest that one-shot sessions may not be markedly different in the development of IL skills than with a librarian as instructor of record. Further research could explore whether the presence of the additional expert (i.e. librarian) to the course instructor may play a role in the increased IL skill development, as indicated in the two Embedded librarian course sections. As suggested by Bene and Murphy (2021), perhaps the support of the second mentor in the course section enhances student learning.

The results suggest that there is a marked increase in IL awareness among students whose instructor collaborated with librarians throughout the process of constructing their course content and championed IL and the relevance of library services to the curricular outcomes of the course.

Therefore, key in achieving an optimal outcome of IL development is to implement strategies such as close librarian collaboration with instructors as early and consistently as possible in the process of course development. Other publications have observed the importance of librarian and instructor collaboration. Wishkoski et. al (2018) note that in considering the significance of collaborative assignment design, librarians play an important role as facilitators. McClurg et al. (2019) argue that "sharing questions about student learning and ideas for improving activities and assignments can provide the basis for deeper discussions of SoTL, potential projects, levels of engagement, and workload capacity" (p. 10). Kim and Shumaker (2015) state:

> librarians and instructors must communicate and collaborate to effectively integrate information literacy instruction into courses. [...] If the two groups fail to engage with each other, the results are likely to be some combination of unnecessary duplication, gaps in coverage, the librarian being seen as having nothing unique to add, and even librarians being marginalized or left out entirely. (p. 456)

Based on the results of this study, we suggest that the amount of librarian involvement in the course is not as impactful as instructor commitment to IL. Library programming and services face similar difficulties with regard to faculty buy-in and they can similarly benefit from faculty championing (for more detail on the aforementioned programming, see Lock et al., 2019; Lock et al., 2020).

The study results suggest that librarian involvement in course design, specifically in inquiry-based learning courses, as either curricular consultants or as course co-developers is the optimal IL instruction delivery method and best promotes library services to students.

Limitations and Future Research

The research team identified two limitations of this study:

(1) Larger scope and sample sizes are needed to corroborate the results of this initial study (statistical analysis, qualitative data, phrase searching, expansion of keywords, etc.). Follow-up studies will shed further light on the efficacy of librarian involvement in a course and will be instrumental in further testing the emergent hypothesis that librarian involvement in the creation of course content itself (where IL instruction can be directly embedded into the course outcomes) is the most impactful IL instruction delivery method as well as the most effective means of promoting library services in a course.

(2) Given the ethical limitations of withholding librarian assistance from a given section in order to generate a baseline that did not involve librarian delivery of IL instruction, this study could not rely on such a baseline for comparison and analysis of results. It is possible, however, that follow-up studies will encounter situations where not all sections of the same course will seek out librarian assistance in course delivery. Such circumstances, given that they are instructor-generated, can provide a follow-up study with a baseline without the ethical concerns related to purposefully withholding librarian involvement for the sake of the study itself.

Future research will need to focus on the development of a statistically viable dataset. Further, the dataset will need to be text analyzed and mined for qualitative data as this study was primarily concerned with quantitative data. The combination of text analysis and text mining in the study by Timakum et al. (2018) provides a model on how to extract more significant information from the existing dataset.

As mentioned previously, text analysis as a methodology for assessing IL skill development has emerging potential. Future research could continue to explore this, as well as the selection of keywords that represent IL in students. A significant responsibility of academic librarians is instruction, and librarian as instructor-of-record is an area of research with potential for illuminating comparisons with the two more common levels of librarian involvement: embeddedness and the single library session. Although there is qualitative literature weighing the benefits and drawbacks of both of these contributions, there is opportunity to quantitatively assess impact.

Finally, as this study was conducted in an inquiry-based learning course, further research could use a similar comparison in different types of course structures.

Conclusion

The results from this study suggest that librarian involvement in course design, with librarians as either curricular consultants or as course co-developers, produces the highest quantitative impact, as assessed through text analysis of student assignments, of student IL skill development. Fostering a librarian-instructor relationship where the instructor champions IL skills, integrates IL goals into course content, and consults with the librarian on ways to maximize IL student development, may be more impactful than the librarian teaching as instructor-of-record, embedded librarian involvement, or the traditional one-shot library session.

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