

# **Amplifying value: Assessment of asynchronous embedded library instruction and the influence of faculty endorsements**

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# **Amplifying value: Assessment of asynchronous embedded library instruction and the influence of faculty endorsements**

“Embedded” librarian programs can take many different forms. At Royal Roads University, librarians embed asynchronously in research-intensive courses via a hosted online forum. Over three to five days, the embedded librarian presents a series of posts on key information literacy topics and invites student questions and comments. This research project undertook to investigate both the general effectiveness of this embedding approach (in terms of student learning and engagement) and the relationship that may exist between instructors’ promotion of the forum and student engagement and/or learning. Quantitative data on student learning and engagement was collected through a pretest/post-test and qualitative data was collected from instructor comments within the LMS course shell. The results of this study indicate that embedding is moderately effective at increasing student knowledge, and that robust instructor encouragement of student participation correlates positively with both student engagement and student learning. We conclude that embedding is an effective information literacy instruction method that can be made more effective through increased relationship-building with faculty and program staff.

Key words: Embedded librarianship; information literacy; assessment; online learning, distance library services

*The authors report there are no competing interests to declare.*

## **Introduction**

Embedded librarianship, in its many forms, has been a topic of discussion for nearly 20 years. The form of embedding where librarians participate in courses housed in a learning management system (LMS) became more relevant with the onset of the COVID-19 pandemic in 2020. As the world shifts to a “new normal” where hybrid education appears to be here to stay, librarians find themselves seeing students online more and in person less. Meeting student needs within the LMS can be efficient, but assessing the impact of librarians’ roles in these spaces is vital to informing the shape this service model should take.

At Royal Roads University (RRU), remote instruction and asynchronous embedding were standard practices long before the pandemic. RRU has delivered programs using a hybrid educational model for almost three decades and has been embedding librarians in LMS course forums since 2011.

In 2014, librarians Will Meredith and Jessica Mussell examined student and faculty attitudes towards the embedded librarian (EL) program at RRU. They found that both students and faculty were enthusiastic about the program, perceived it to be effective, and valued the availability of librarian expertise at the point of student need. However, Meredith and Mussell's study did not attempt to objectively measure the efficacy of the EL program (Meredith & Mussell, 2014). With no summative or formative assessment, librarians at RRU could never really be sure how much students were learning. Additionally, there has always been a mysteriously high degree of variation in the level of student engagement in the forums. We theorized this to be at least partly linked to the degree of enthusiasm the course instructor exhibited for the librarian's contributions, but we had no evidence to confirm this hypothesis.

The present study sets out to explore the questions of (i) how well students learn in embedded forums and (ii) the degree to which student engagement is influenced by instructor sentiment towards the library.

## **Literature review**

### ***Embedded librarianship & online learning***

Embedded librarianship is broadly described in the literature. Dewey, credited with coining the phrase in 2005, had the most proactive and systemic conception of the term. She argued that librarians should contribute to curriculum development, consult on physical and virtual campus

spaces, participate in faculty-driven research, liaise with student governing bodies, support institutional fundraising efforts, and participate in campus governance (Dewey, 2005). Literature on embedded librarianship published since has built out from Dewey's vision more than on it. Where Dewey focused on librarians embedding throughout their post-secondary institutions, the literature that followed has focused more on librarians meeting student needs in the literature search process, positioning themselves in spaces "occupied by their patrons, either physically or digitally, in order to be part of the patrons' culture and provide richer and more focused service" (Freeman, 2020).

Within this narrower focus, there is considerable diversity. In her review of the literature on embedded librarianship, Schulte found "disparity in how embedded librarianship is being defined and used in common practice, ranging from embedding an online component into a single course to full physical and cultural integration into an academic college or business unit of an organization" (2012, p. 122). Embedding has been used to describe activities as diverse as physically relocating to within an academic department (Bartnik et al., 2010), to providing in-person support to teams of students working on research projects (Berdish & Seeman, 2010), to co-teaching with faculty in synchronous research courses (Franzen & Sharkey, 2021), to participating in curriculum development (Hoffman et al., 2017; Kumar et al., 2010).

A dominant theme in the embedded librarianship literature relates to providing student support in online courses hosted within a learning management system (Bennett & Simning, 2010; Freeman, 2020; Heathcock, 2015; Levey & Nowak, 2015; Moran & Mulvihill, 2017; B. Tumbleson et al., 2019). Librarians typically staff their own discussion forums within targeted courses, posting context-specific guidance or learning objects and responding to student questions or concerns (Aquila & Wolfe, 2023, p. 7). Embedding librarians within an online

course allows for point-of-need student support and enables librarians to tailor their assistance to course assignments (B. Tumbleson et al., 2019).

Aquila and Wolfe refer to embedding in the LMS as “micro-level embedding” (2023, p. 4), while others describe it as “just in time” rather than “just in case” (Harkness et al., 2021; Heathcock, 2015; Wu et al., 2013). Woods (2022) examines the utility of just-in-time embedding in the context of professional (MBA and DBA) programs. Citing Read and Morasch (2016), Woods posits that this just-in-time embedded support model is especially valuable for graduate students who “might be overwhelmed by work and family” and thus benefit from “targeted and specific IL instruction and support at the right time for key assignments” (2022, p. 217).

Providing overwhelmed distance students with timely library research instruction serves to reduce “transactional distance”, a term coined by Moore (1993) to describe the “psychological and communications space” between the online student and the material shared by the instructor (or in this case, the librarian). Charles and DeFabiis explored whether the presence of an embedded librarian in an online course decreases transactional distance experienced by students (2021, p. 374). Students in a graduate education course were asked to rank how different forums within the course site (student to student, instructor to student, and librarian to student) served to mitigate their sense of transactional distance. While the students ranked the value of the librarian forums behind both the faculty member’s availability and the peer forums, 54% of responding students reported that the librarian’s presence reduced their sense of transactional distance.

### ***Assessing embedded librarianship in the LMS***

Assessing the impact of library service embedded within the LMS is made difficult by the fact that this service is usually an add-on and students are rarely graded on their understanding of the information literacy instruction provided by the librarians. In the absence of grading

opportunities, librarians find other ways to gauge the success of their embedded work, often using multiple methods in each study.

The simplest assessment approach, requiring modest participation from students, is to survey students at the end of their courses to ask their opinion of the librarians' embedded service and to self-assess their learning (Hoffman et al., 2017; Levey & Nowak, 2015; Meredith & Mussell, 2014; Wu et al., 2013). While this approach can provide useful insight into student and faculty appreciation of the embedded service—not to be dismissed—it does not provide an objective view of how effective the service is.

A more rigorous approach tracks changes in student knowledge through a pretest and post-test administered to students before and after the embedding. This works well in classroom settings, where response rates are improved by students being given class time to complete the tests (Franzen & Sharkey, 2021, p. 314), but the most robust response rates are achieved when these tests are a graded part of the curriculum (B. Tumbleson et al., 2019, p. 202). Harkness et al. provide the only example we found of being able to use graded work to assess embedding. Collaborating with faculty in an undergraduate political science course, and comparing course offerings with and without an embedded librarian, the authors partly aligned student quizzes with the librarians' learning objectives (Harkness et al., 2021, p. 393). Their sample size was too small to make statistically sound conclusions (p. 395) but their response rate was 97%.

Conversely, when assessments are administered asynchronously, response rates are typically much lower. Frequently, response rates are fairly high on pre-tests and drop off sharply on post-tests. For populations under 1000, a minimum sample size of 30 percent is recommended to ensure representativeness (St Olaf College, n.d.). This is often achieved for pre-tests, but a typical response rate for post-test assessments seems to be between 20 and 30 percent (Edwards

et al., 2010; Lonn et al., 2011; Wu et al., 2013; Zakharov & Maybee, 2019), with some authors reporting post-test returns as low as 5.7% (B. E. Tumbleson & Burke, 2010) and 11.6% (Figa et al., 2009).

A frequently used assessment method that requires no student participation is evaluating the quality of sources students cite in their papers (Alverson et al., 2019; Charles & DeFabiis, 2021; Haber & Mitchell, 2017; Heathcock, 2015; B. Tumbleson et al., 2019). The rubrics used to assess quality of students' references in each of these studies are distinct from one another and most were created in-house, reflecting the researchers' different interpretations of priorities.

Heathcock recorded each student's choices of source type and scored citations for both their temporal appropriateness and their quality on a four-point scale from "inadequate" to "superior" (2015, p. 16). Alverson et al. tracked whether students included enough sources, the proportion of sources that were deemed scholarly, and whether the sources were from the library collection (2019, p. 36). Rubrics from Haber and Michell (2017, p. 310) and Charles and deFabiis (2021, p. 374) were more concerned with the intellectual relevance of the students' selections than the source types. Tumbleson et al. (2019) borrowed the "Information Literacy in Student Writing Rubric" (Jastram et al., 2014, p. 181), which is concerned with students' capacity to frame and present a coherent argument in their writing; this rubric is concerned about 'quality' of citations only insofar as the references serve to support the argument.

### ***The importance of faculty endorsement and/or participation***

Whatever the approach, successful assessment of embedding requires the goodwill of the faculty instructor—whether to encourage student participation in a survey, permit administration of a pretest/post-test, or provide access to student work for analysis. Beyond this, just getting in the door to begin embedding requires the librarian to build and maintain good relationships with

faculty. Most articles on embedding note the importance of this faculty–librarian relationship to the success of these programs (Aquila & Wolfe, 2023; Charles & DeFabiis, 2021; Franzen & Sharkey, 2021; Freeman, 2020; B. Tumbleson et al., 2019; and many earlier references cited therein). Tumbleson (2016) states that “[f]aculty collaboration makes embedded librarianship in the LMS possible” (p. 225), while Franzen and Sharkey make the point that “students better recognize the legitimacy of the librarian and understand their full scope of expertise when the instructor publicly supports the authority of the embedded librarian” (2021, p. 312).

Although the importance of the faculty–librarian relationship is frequently noted in the literature, we could find no articles that provide concrete evidence for the measurable value of faculty buy-in with embedding librarians in the LMS. Does faculty encouragement actually drive students to engage more deeply with the librarian forum or to learn more from it? Throughout the papers discussed above, the relevance of faculty buy-in is asserted, but never directly examined or questioned. Our approach, which directly measures the relationship between faculty buy-in and student engagement and learning, therefore addresses a gap in the literature by attempting to validate this long-standing assumption.

## **History and Overview**

Royal Roads University (RRU) is a public, special-purpose university in Victoria, British Columbia. The school serves approximately 3000 full-time equivalent students, the majority of whom are mid-career professionals seeking applied master's degrees in areas such as environmental management, human security, and educational leadership.

Since its establishment in 1995, RRU has embraced a “blended learning model” that allows students to “learn at their convenience while staying connected to their communities” (Royal Roads University, 2022, p. 7). Master’s programs are typically two years in length;



during that period, students visit campus twice during their program for intensive 2-week residencies, but most courses are completed online. Two defining characteristics of RRU's educational approach are its cohort model, where students work through much of their programs with a core group of classmates and thereby maintain a sense of human connection to their learning, and the university's Learning, Teaching, and Research Model (LTRM), which describes the mission and methods underlying the university's approach to education and articulates its student-centered service model across programs (Royal Roads University, no date).

### ***The history and practice of embedding at Royal Roads***

Embedded librarianship (EL) at Royal Roads University began in the spring of 2011. Up to that point, information literacy instruction at RRU had taken the form of a pair of in-person sessions, delivered during each program's on-campus residencies, with the second session building on the first. As changes to program delivery models made scheduling library instruction more challenging, RRU librarians replaced the second in-person session with online embedding. This shift ensured students could benefit from advanced literature searching instruction without sacrificing their limited time on campus.

This embedding occurs within Moodle, the university's LMS. All graduate programs at Royal Roads include a required research course where students learn about research methods and produce a literature review. The EL program deliberately targets these courses, taking a "just in time" approach (Harkness et al., 2021; Heathcock, 2015) to information literacy instruction. Within the course shell, the embedded librarian hosts a standalone "Ask the Librarian" forum where they share posts on key information literacy topics. RRU librarians maintain a shared repository of prepared posts for this purpose. While the text and number of posts varies somewhat from program to program and from librarian to librarian (for example, sample

research topics vary widely and are catered to the specific interests of a particular cohort), four core posts on fundamental information literacy topics are shared in all EL forums:

- Available search tools, from Google Scholar to the discovery layer to vendor-specific platforms
- Developing a research topic and constructing searches
- Scholarship as a conversation and citation mining
- Finding known items, including through interlibrary loan

Students are encouraged to respond to the posts with questions or comments, create their own posts, and respond to comments and questions made by their classmates.

The complement of librarians at RRU has always been low proportional to the student body, so it has been an enduring goal of the EL program to balance quality with sustainability of the service. To this end, librarians' involvement in all courses is asynchronous, the time commitment is limited to 3–5 days, and the timing of the librarian's engagement in each course is negotiated with faculty to coincide with the point where students are beginning to plan and research their literature review. Where some institutions have experimented with EL programs like ours and found them unsustainable (Aquila & Wolfe, 2023, p. 11), we view them as a time-saving mechanism, especially when weighed against the number of one-on-one student research appointments that are pre-empted (Meredith & Mussell, 2014, p. 90). Our embedded service does not reach the level of sustainability and scalability described in Moran and Mulville (2017, p. 14), which involves multiple stand-alone online tutorials; still, by targeting research-intensive courses and repurposing instructional material, our small number of librarians can engage meaningfully with a large number of students in an efficient, targeted way.

Over time, the EL program has become an established aspect of information literacy instruction at RRU. The number of courses with an embedded librarian doubled between 2014 and 2021. We have established standing agreements with all faculties for the Ask a Librarian forum to be offered in almost all research methods courses across all master's-level programs, as well as many bachelor's and doctoral programs. Specialized embeddings—such as a forum about Zotero and a forum focused on market and industry research—have also been added to the offerings.

### ***Faculty involvement with embedding***

In the Moodle LMS, a course's "shell" (the basic course structure, including welcome messages, weekly content, standard resource lists, etc.) is usually copied over from one instance of the course to the next; as part of this process, the framework for the Ask a Librarian forum, including the forum description, also gets rolled over with little or no involvement by either course faculty or librarians. Partly because of this semi-automated process, faculty involvement in the Ask a Librarian forums varies widely. Some faculty are very aware of the librarian's presence and enthusiastically encourage their students to participate, occasionally making active participation a course requirement. Other faculty seem only vaguely aware that the forum is being offered in their course, making no effort to promote our presence. A very small number of faculty also share their own separate information literacy posts that duplicate and sometimes contradict the librarian's efforts.

### ***A note about Covid-19***

Although data collection for this project occurred while university operations were impacted by Covid, we do not consider the impact of Covid in this paper as it did not modify our EL

processes in any meaningful way. Beyond adjusting our posts to reflect Covid-driven service changes, we did not alter the timing or nature of librarian embeddings during the closure of the physical university in 2020–2021.

### **Impetus for this study**

This study investigated two aspects of embedding: educational effectiveness and drivers of engagement. Embedded librarianship as a practice at RRU is now more than a decade old. We are in a groove, developed over time. We know, anecdotally and from the 2014 study, that students are satisfied with the forums and perceive them to be helpful—and we can infer from the rise in demand for the service that faculty appreciate it—but we have no evidence of how well students learn the material that is presented.

We have long wondered about the factors that drive student engagement in the EL forums. Moodle forum settings make it impossible to know which students are reading which posts (see the Discussion section “Value of instructor encouragement as a motivator”), and engagement as measured by the number of student comments, questions, or posts varies widely within and across programs. It is not uncommon to receive zero comments from students for the duration of a forum, even though anecdotal feedback from instructors indicates that the students are reading and receiving value from the posts. On the other hand, both authors of this paper have hosted forums where students have collectively created dozens of their own posts and actively engaged with the posts and comments of their classmates and the librarian. “Typical” engagement with an EL forum falls somewhere between these extremes, but anything is possible.

More than a decade of observing the ups and downs in forum participation led librarians at RRU to hypothesize that student engagement is related to instructor enthusiasm. Specifically,

it appeared to us that students were more actively engaged in the EL forums in cases where the instructor was highly engaged with the librarian and visibly enthusiastic about the forum with their students. We wanted to investigate whether this correlation holds.

### ***Research questions***

With these topics in mind, we formulated our research questions as follows:

- (1) Is embedding effective? (Do students' knowledge of fundamental IL concepts increase from the beginning of the forum to the end?)
- (2) Is it resonating with the students? (Do students perceive the forum to be effective, and do they appreciate it?)
- (3) How does an instructor's (overt or tacit) encouragement that students participate in an EL forum influence student engagement?

### **Research methodology**

This study was reviewed and approved by the Royal Roads University Research Ethics Board in the summer of 2021. The research took a primarily quantitative approach. Data on student learning were collected through a pretest/post-test. Data on instructor encouragement and student engagement were collected from comments posted within the course shell.

To assess student learning in the forum, we compared the pretest and post-test scores to derive a measure of change over time and used a paired t-test to assess the significance of the results.

To assess the relationship between instructor encouragement of student participation in the EL forum and the students' actual engagement and learning, we conducted a sentiment

analysis on descriptive text and instructor comments within the LMS. From this analysis, we derived a quantitative measure of instructor encouragement. We then performed multiple regression analyses to interrogate the relationship among the three factors of educational effectiveness, student engagement, and instructor encouragement.

### *Data collection*

Data for this project were collected from EL forums hosted over a full twelve-month period, from September 2021 to September 2022. We included in our study all forums that utilized the core four-post template outlined earlier. Forums that did not follow this format (e.g., forums focused on the Zotero citation manager) or that appeared at the beginning of a program rather than in the research methods course were excluded.

40 EL forums ran during this period. Of these, five were out-of-scope based on the above criteria. Two additional forums were excluded due to the pretest survey not being included in the forum in the right time frame. Therefore, 33 forums were included in this study. Of these, 31 forums were offered in master's programs; one forum occurred in an upper-level course in a bachelor's program and one forum occurred in a doctoral program.

### *Standardization across embedded forums*

The researchers made a conscious effort to standardize the embedded service during the data collection period. Most of the embedded sessions offered during the period of analysis were conducted by one of the authors of this study, who intentionally kept the variation in the core posts to a minimum. (The second author was on leave during the period of data collection.) A handful of embedded sessions included in the analysis were hosted by another librarian who is not an author on this study. This librarian was made aware of the ongoing research study and

agreed to retain the same core posts and approximate wording for their embedded sessions as well.

Altogether, 765 students participated in the included forums, with the number in each course section ranging from 8 to 72. Table 1 describes the programs, levels, and total number of student participants included in each forum.

Table 1. Forums included in the study.

<b>Program area</b>	<b># of course sections</b>	<b>Total enrolled students</b>
Business administration	3	113
Communication	3	56
Environment (3 programs)	8	217
Global management	1	29
Humanitarian studies (3 programs)	5	85
Interdisciplinary studies	2	51
Leadership	8	143
Learning technology	2	41
Tourism	1	30
<b>TOTAL</b>		<b>765</b>

### ***Pretest and post-test***

For each included forum, a voluntary pretest and post-test were administered to students in introductory and concluding posts. The researchers solicited each instructor’s approval before posting the invitations to the pretest and post-test, and students provided informed consent before completing each test. Students could choose to participate in the pretest only, the post-test only, or both, although the researchers made it clear that it would be most helpful if they participated

in both instruments. Students who completed either test could choose to participate in an anonymous draw for a gift card (so students who completed both tests were eligible to enter the draw twice).

The core of the tests was a set of four “knowledge check” questions intended to assess students’ familiarity with basic information literacy concepts addressed during the forum (see below). Two questions concerned the library’s discovery layer and two questions were about search strategies. The discovery layer questions were “old information”—things the students should have been previously exposed to during a one-shot synchronous session at the beginning of their program—while the search strategy questions were “new information”—not formally shared by librarians before the forum. To ensure comparability, identical knowledge-check questions were presented on the pretest and post-test.

#### Knowledge-check questions (pretest and post-test)

- Q1. Discovery is the main search box on the Library homepage. What does it enable you to search?
- Q2. When searching Discovery, how can you limit your search to peer reviewed articles?
- Q3. What is the advantage of using quotation marks in your searches, for example "oil and gas"?
- Q4. When searching for literature on a topic that can be described in more than one way - for example, “adolescence” / “adolescent” - how can you look for both at once?

Beyond the knowledge check, the pretest and post-test also contained additional components. For the pretest, a single open-ended question sought information about the student’s self-assessed information literacy needs. For the post-test, additional components included a series of Likert (1–5 scale) rating questions about the perceived utility of each main forum post and the forum overall, as well as an open-ended invitation to provide additional feedback. We briefly address



the results of the Likert scale questions below; results from the open-ended questions were of only anecdotal interest to individual librarians and are not discussed in this paper.

We made an early decision not to track students individually across the pretest and post-test, as we did not want to capture this degree of personal information (and we specifically built into our ethics review a commitment not to do so). We turned off IP tracking in our survey instrument and did not capture any identifying information from students. As a result, our study reports test results only in the aggregate.

See Appendix A for our research instruments, including invitation script, informed consent documentation, pretest and post-test questions.

### *Gauging student and faculty forum participation*

In addition to the pretest and post-test, which required active student engagement, we also collected and analyzed data from the forum descriptions, the forum discussions, and faculty posts throughout the course to better understand the relationship between instructor messaging and student engagement.

We collected the following data:

- Whether or not the instructor commented in the forum at least once (binary measure);
- Total number of times the library, librarians, or the librarian's forum was mentioned by the instructor within the course site;
- Number and percentage of students and instructors who posted something substantive to the library forum—where “substantive” was broadly defined as “anything that adds to, reflects on, elaborates on, or questions another post in the forum.” This definition includes just about anything beyond simple “thank you” posts or off-topic comments.

We sought and received permission from instructors to collect this information after the completion of the EL forum but before collecting the comments.

Student and faculty participation counts were collected manually by returning to each forum approximately a month after its completion and hand tallying the relevant data points. To identify relevant instructor comments, the researchers used the LMS's built-in search function to search for instances of the character string **librar\*** mentioned by faculty anywhere in the course. The researchers then manually combed through these mentions to identify and score instances where the instructor was speaking to students about the library or the EL forum.

We did not capture student posts about the library or librarians that occurred outside the embedded forum as these were out of scope for this study and we did not have informed consent to collect them.

Data points were tagged with metadata associated with the particular course offering (e.g., course number, instructor, forum run dates, and number of students enrolled in the course) and saved in a spreadsheet for subsequent analysis.

## **Data analysis**

### ***Scoring the pretest and post-test***

The researchers worked together to establish an answer key for the questions (Appendix B). One researcher graded the pretests and post-tests according to the answer key, engaging the second researcher whenever a response was not clearly correct or incorrect. The first researcher then re-graded a sample of responses (approximately 25% of pretest and post-test responses) several months after the first round of grading to ensure reliability.

### *Issues encountered during scoring*

During this process, we realized that the wording of Q1 (which asked about the library's discovery layer) was too open-ended and did not make it sufficiently clear what sort of response we were seeking. Many students gave incomplete answers to this question based on our scoring criteria, although if pressed in conversation, they may well have been able to give a more complete response. Also, in many cases, it was clear that the respondent had simply copy-pasted the description of Discovery provided on the library homepage into the questionnaire response box (a tactic that shows initiative but does not illustrate prior knowledge!). As a result, many responses to this question were awarded half points, and many were excluded from analysis. It is likely that a better-phrased question would have yielded higher scores for Q1.

## **Search our collections (Discovery)**

Search for books, scholarly journals, newspaper articles, ebooks, theses and dissertations, videos, and more using our Discovery search tool.



The screenshot shows a search interface with three tabs at the top: 'Keyword search', 'eBooks', and 'Journals by title'. Below the tabs is a search input field with a magnifying glass icon and the text 'Q Search' on a red button to its right. At the bottom of the search area, there are two links: 'Access the A-Z database list' and 'Use the Advanced Search'.

Figure 1. Screenshot from <https://library.royalroads.ca> showing the description of the RRU Discovery layer provided above the search box on the library's homepage.

A different sort of problem was revealed by the responses to Q4. The researchers had intended with this question to interrogate students' knowledge of the Boolean operator OR. However, an unfortunate choice of example led to a situation where either truncation or Boolean OR could be correctly applied. This did not make the question ungradable, but it did broaden the

correct response space beyond what the researchers had intended and beyond the content covered in the related forum post (which discusses the use of AND and OR but does not discuss truncation). As discussed below, even with this wider array of possible correct answers, this question still scored extremely poorly across all cohorts.

Scoring issues such as these underline the importance of conducting a pilot test before beginning such a study, which, for reasons of time pressure, the authors were unable to do.

### *Coding sentiment scores for faculty posts and forum descriptions*

“Instructor encouragement”—the level of encouragement students received from instructors to engage with the EL forum—is a nebulous concept. We used sentiment analysis to help quantify this concept for analysis. “[S]entiment analysis is the process of using algorithms and computer technologies to systematically detect, extract, and classify the subjective information and affective states expressed in a text, such as opinions, attitudes, and emotions regarding a service, product, person, or topic” (Lei & Liu, 2021, p. 1). In lay terms, this involves using a codebook to assign positive and negative numerical values to text according to the perceived strength of their sentiment, with negative numbers being awarded to negative descriptors and positive numbers being awarded to positive descriptors.

The authors performed sentiment analysis on two different datasets captured from the course shell: the descriptions for each EL forum and set of faculty-created, student-directed posts referencing the library or the librarians within each course. We chose to analyze these datasets separately because they represent different points of possible student engagement and because forum descriptions often roll over from one course offering to another and can therefore differ in tone and sentiment from the individual instructor’s own posts.

While the work of sentiment analysis is often automated, with language processing software scoring text according to an established lexicon, the validity of automated sentiment scoring has been found to be unreliable and unsatisfactory (Boukes et al., 2020; van Atteveldt et al., 2021). Even if the software's lexicon is thorough—so all substantive words can automatically receive a point value—computers are prone to misinterpret context and meaning and generate scores misaligned with those produced by human coders (van Atteveldt et al., 2021).

Given these limitations and the relatively small corpus of data we had to analyze, the researchers chose to code the text in this project manually. This allowed us to better capture the nuance of how and when words were used and to ensure that we only coded words that communicated sentiment about the forum or librarians. For example, faculty sometimes mentioned the RRU Writing Centre in the same posts where they mentioned the EL forum. By hand-coding, we were able to omit from analysis such tangential references and focus specifically on sentiment related to the library. We were also able to distinguish words that described the experience of conducting library research from those that spoke to the contributions of the librarians or the EL forum specifically.

#### *Lexicon selection and coding process*

A key aspect of sentiment analysis is defining and consistently applying a lexicon (Al-Shabi, 2020). The researchers chose the AFINN lexicon, developed by Finn Årup Nielsen and available on Github, as the basis for their sentiment codebook. “AFINN is a list of words rated for valence with an integer between minus five (negative) and plus five (positive)” (Nielsen, 2011, 2018). To establish a workflow and mental frame for scoring sentiment according to this lexicon, one of the researchers began by looking at forum descriptions. To make sure they understood the scoring, they copied and pasted the forum descriptions—both in their entirety as well as line by line—

into the scoring application available at <http://darenr.github.io/afinn/> and compared the automatically generated scores against the rubric for that lexicon.

The AFINN lexicon provided a very useful platform from which to begin the coding process, but the vocabulary was an understandably imperfect fit for the work. As noted in Boukes et al., “[f]or sentiment analysis tools to function well, they must recognize the appropriate valence of words and word-combinations *in the particular domain that they are employed* and avoid importing valence judgments that do not transfer between domains” (2020, p. 85, emphasis ours). Further, many words that surfaced in our dataset did not have existing point values and many words with existing point values were irrelevant to our context. The codebook and scoring rubric we ultimately used had AFINN as its foundation but included additional words and point values according to our own alignment with the source list. The codebook was developed by one researcher and independently vetted and verified by the other. We have made our codebook available in Appendix C; researchers undertaking a similar analysis are welcome to use and adapt it.

The actual process of scoring the datasets was as follows. For each instructor post or forum description:

- (1) Identify each descriptive word in the text that refers to the EL forum or the librarians;
- (2) Score each descriptive word based on the codebook. Each word receives a value between +5 (very positive) and –5 (very negative), with 0 assigned to neutral words;
- (3) Add up the sentiment scores for each set of instructor posts and each forum description;
- (4) Divide the total sentiment score by the number of descriptive words in the posts/forum description to arrive at an average sentiment score for each course.

At step 3, sentiment scores are cumulative; scores at this stage varied tremendously, based on

how often the instructor posted about the library and the librarian forum. So, for example, a course where an instructor made one glowingly positive post about the forum had a lower score than a course where an instructor made ten tepidly positive posts about the forum. In the aggregate this is a valid reflection of positive influence, but it conflates sentiment strength with frequency. To avoid confounding these two variables, we calculated a mean sentiment score (step 4, above). In this way, each course in the study received a normalized score for instructor engagement. In the analysis section below, we discuss how we used both the normalized scores and the raw frequency scores in our analysis of the impact of instructor engagement.

## **Findings**

### ***Student performance: pretest and post-test***

Out of 765 students who were enrolled in the 33 course sections involved in this study, 286 completed the pretest (a 37.4% response rate) and 53 completed the post-test (a 6.9% response rate). These rates are generally in keeping with what is reported in similar studies (Edwards et al., 2010; Wu et al., 2013), although our pre-test results were somewhat higher than typical and our post-test results were somewhat lower. The discrepancy between these completion rates caused us to rethink our approach to analysis. While we had initially intended to report pretest/post-test results for each cohort, we felt the post-test response rates for many cohorts were too low to effectively analyze at that level of granularity. Therefore, we chose to run our statistical comparison at the level of the entire population in aggregate. Franzen & Sharkey (2021) took a similar approach, creating and reporting on composite scores in order to mitigate the impact of varying participation levels across semesters (p. 313).

As we were also preparing these data for statistical regression analysis in a later part of

the study, we wanted to ensure that each individual cohort included in the analysis was minimally viable. To achieve this, any cohort with 1 or 0 respondents on the post-test was excluded from analysis. These exclusions left us with a comparative sample of 15 cohorts drawn from 7 different programs. A total of 408 students were enrolled in these course sections, of which 162 took part in the pretest (39.7% response rate) and 46 took part in the post-test (11.3% response rate). This cleaned dataset was used in all subsequent analysis reported in this paper.

### *Score improvements from pretest to post-test*

To analyze the effect of the forum on student learning, we compared the mean score on the pretest to the mean score on the post-test. We ran two sets of comparisons:

- (1) **Total score improvement:** overall average change in score between pretest and post-test.
- (5) **New information score improvement:** average change in score between pretest and post-test just for questions 3 and 4.

Separating out questions 3 and 4 in this way allowed us to focus on information that had not been covered in previous library instruction (see the Research Methodology section “Pretest and post-test”). Since most students were likely exposed to the information tested in these questions for the first time during the forum, they offer a more robust measure of how student knowledge was influenced by the EL forum.

The average score on the full pretest was 58.5%, rising to 70.9% on the post-test, for a **total score improvement** of 12%. The average score just on Questions 3 and 4 was 45.8% on the pretest and 66.6% on the post-test, for a **new information score improvement** of 21%.



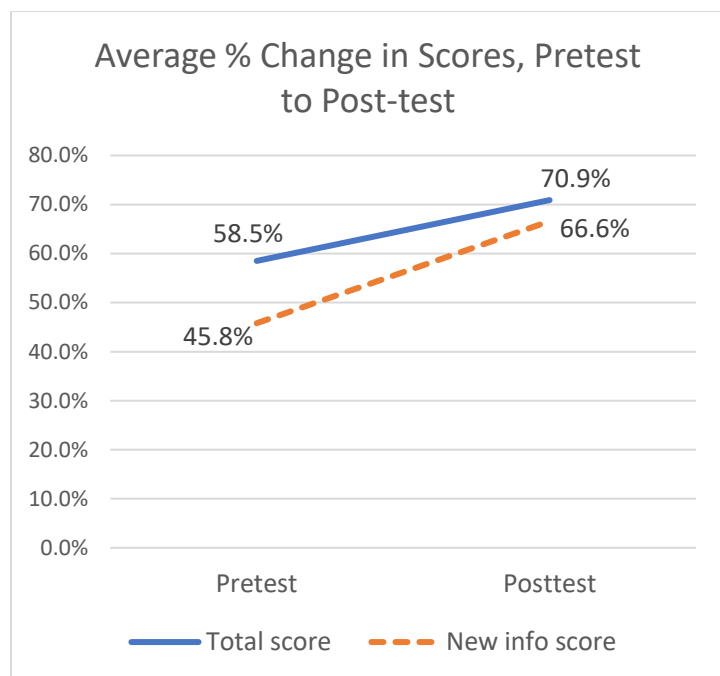


Figure 2. Average percentage change in scores from pretest to post-test.

We conducted a paired t-test to assess the statistical validity of this result. A paired t-test is used when comparing pre- and post-treatment measurements across a single test group (Knapp, 2017). Here, the treatment is the EL forum and the test group is the full set of participants across the included cohorts. We began by assessing normality in the differences between the pretest and post-test to ensure validity of the paired t-test. The histograms for both the full test and Q3-4 show a normal distribution. We then ran two paired t-tests to assess the significance of the differences between the pretest and post-test scores. The paired samples test shows a two-tailed p-value below 0.05 for both the total score improvement ( $t = 2.8, p = 0.014$ ) and new information score improvement ( $t = 3.9, p = 0.002$ ). This indicates that the change in score between the pretest and post-test is statistically significant.

The results of this pretest–post-test activity are not generalizable. The major limitation is the low participation rate on the post-test, which is below the threshold for true statistical

significance in small populations. Additionally, due to the anonymous and optional nature of each activity, we cannot guarantee that the same participants took part in each test. Due to these limitations, these findings must be taken as indicative rather than definitive. Still, the p-values are strong enough to feel some confidence that the results are not due to chance.

Furthermore, there's a difference between practical significance and statistical significance. From a practical perspective, an improvement in test scores of 20% over the course of the forum suggests to us that the forum is at least moderately effective. While there is a lot of noise in this data, on a gross level it appears that students are learning.

### ***Instructor encouragement as a predictor of student engagement and learning***

To investigate the potential relationship between faculty encouragement and student engagement and learning during the forum, the researchers ran a series of regression analyses using SPSS to determine the strength of the relationships between sentiment score of an instructor's posts and student learning.

Whereas we could use all participants scored in aggregate to evaluate pretest/post-test scores, regression analysis requires a set of discrete data points for pairwise comparison. Therefore, we use the same set of 15 cohorts with relatively robust post-test performance as were used to evaluate student learning (excluding those with zero or one post-test respondents—see the Findings subsection “Problems with sample size”) but disaggregated the data into cohorts for the purpose of this analysis.

The statistical analysis focused on the question: Is faculty engagement a predictor of student engagement or performance (learning)?

To answer this question, we identified three possible measures of faculty engagement (faculty sentiment score; total mentions of library or forum; course description sentiment score)

and crossed them with a measure of student engagement (proportion of students who made a substantive post) and two measures of student performance (mean post-test score; percentage change between pretest and post-test scores). Altogether we performed nine regression tests to investigate the relationships among these factors. Across the nine regression analyses, two analyses revealed moderate positive correlations (bolded below). Both correlations are connected to faculty sentiment.

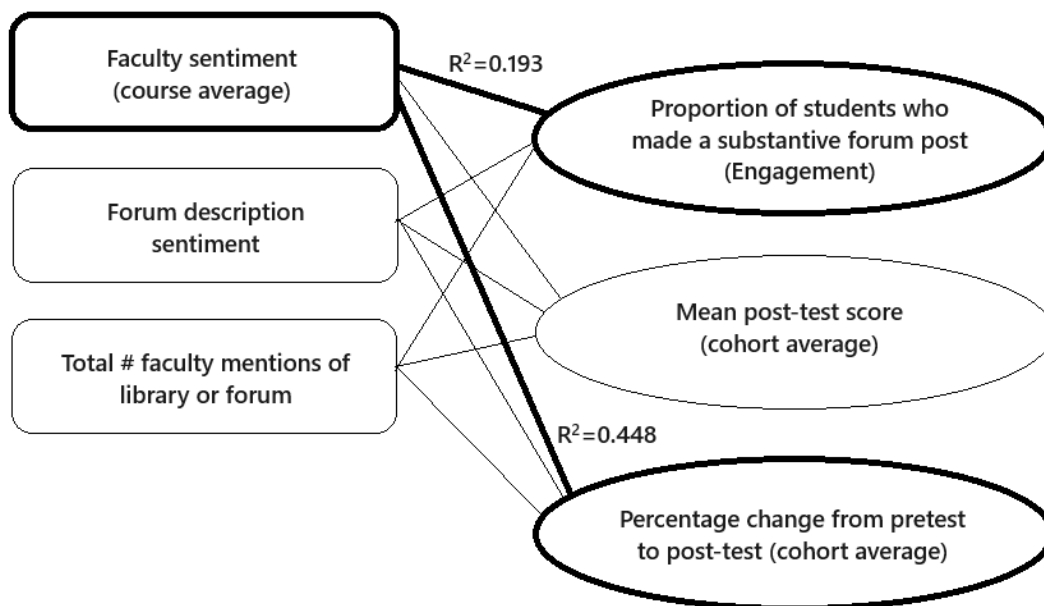


Figure 3. Regression analyses performed. Three measures of faculty engagement were crossed with one measure of student engagement and two measures of student performance.

The strongest correlation was between faculty sentiment and student performance (as indicated by the average change in the score from pretest to post-test). The linear regression found an  $R^2$  value of 0.448 for this relationship, indicating that about 45% of the variance in student scores can be explained by the degree of faculty encouragement. In other words, it appears that students in cohorts where faculty spoke positively about the EL forum were more likely to learn

something from the forum overall.

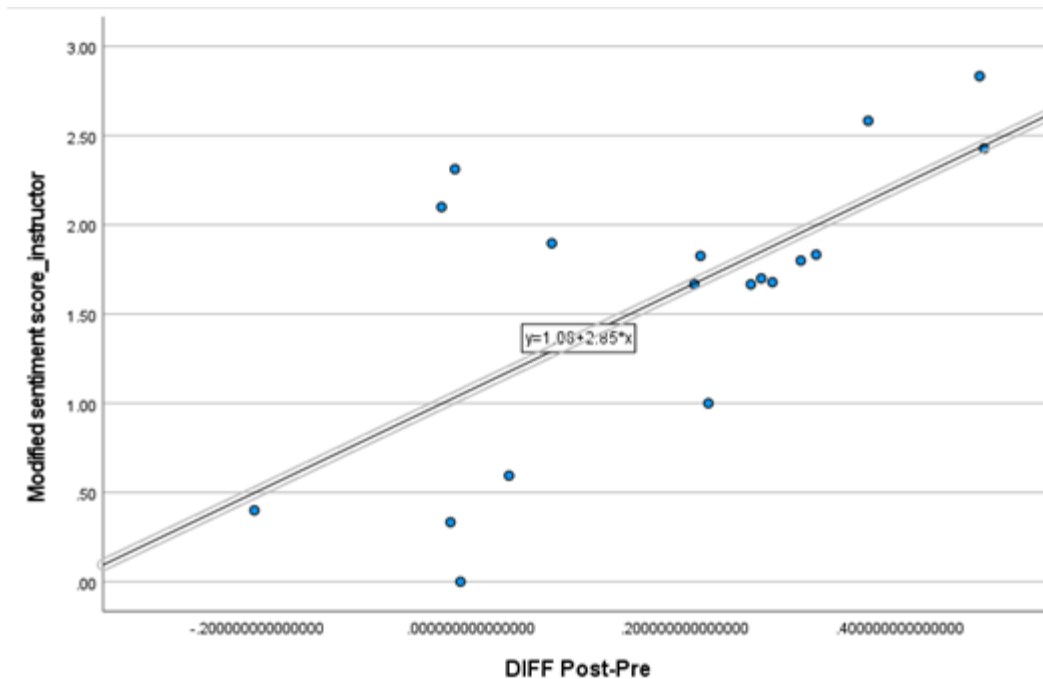


Figure 4. Correlation between faculty sentiment and the average change in score from pretest to post-test (performance).  $R^2 = 0.448$  [moderate positive correlation].

Less strong, but still worthy of note, was the correlation between instructor sentiment and student engagement as measured by the proportion of students who made a substantive post in the forum. The linear regression showed an  $R^2$  value of 0.193 for this relationship. The distribution of data suggests a univalent correlation: high instructor enthusiasm appears to be a necessary but not sufficient condition to yield high student engagement. In other words, students exhibited high engagement sporadically when the instructor was enthusiastic, but *never exhibited high engagement when the instructor was unenthusiastic.*

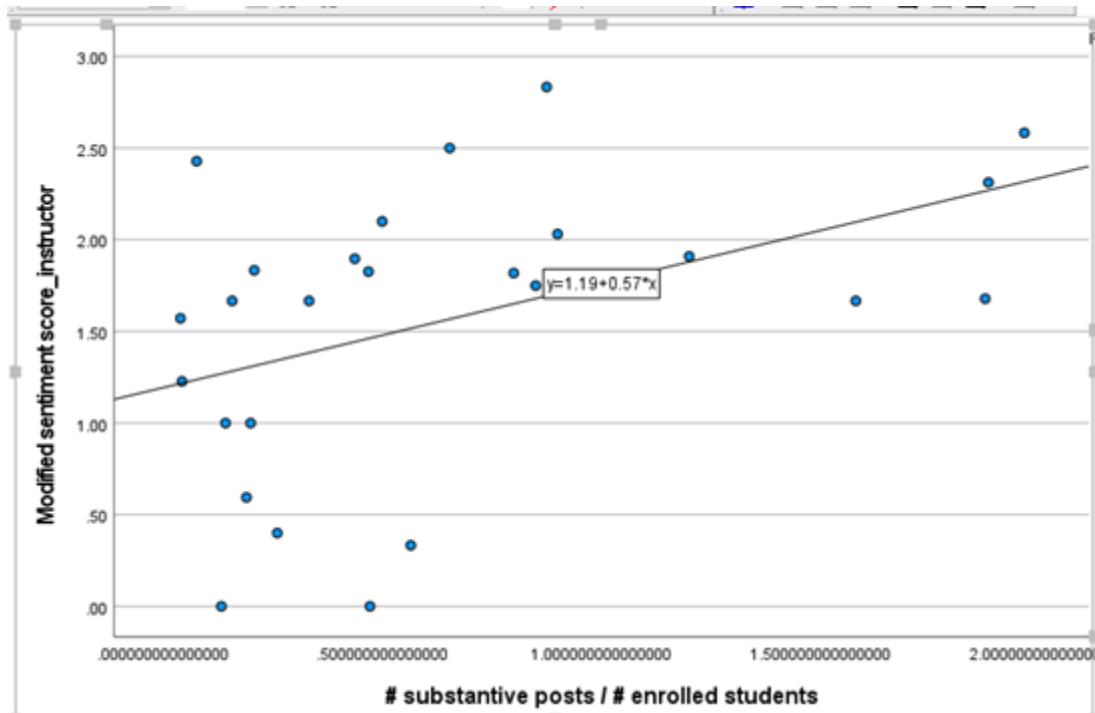


Figure 5. Correlation between faculty sentiment and the proportion of students who made a substantive post (engagement).  $R^2 = 0.193$  [moderate positive correlation] with a lot of noise at the lower end of the X axis.

Other regression analyses showed no significant correlations. Based on this study, there appears to be no relationship between the frequency of instructor mentions of the library (separate from sentiment) and student performance or engagement, nor between positive sentiment in the forum description and student performance or engagement.

### ***Relationship between student engagement and student learning***

Although it did not directly relate to our established research questions, we also wondered whether there might be a relationship between student engagement and student learning: i.e., do cohorts that participate actively in the forum (by posting questions and comments) also perform better on the post-test and/or show greater improvement between the pretest and the post-test?

To answer this question, we ran an additional series of two regression tests. We identified one measure of student engagement (proportion of students who made a substantive post) and crossed it with two measures of student performance (mean post-test score; percentage change between pretest and post-test scores). These tests revealed no significant correlations among factors.

### *A note on student qualitative feedback*

A third aspect of our research sought to verify whether students perceive the forum to be effective, and whether they appreciate it. To answer this question, we looked at the responses to the Likert scale questions included at the end of the post-test, which asked students to rate the perceived utility of each of the four key EL forum posts, as well as the forum overall.

As it turned out, this was not a particularly interesting line of inquiry. Among those who completed the post-test, respondents overwhelmingly gave very high ratings to both the individual forum posts and the EL forum itself, with average scores for each topic above 4.5 out of 5. There was too little variation in the scores to draw any meaningful conclusion about students' relative interest in the topics covered by the forum—although clearly those who participated consider the forums to be valuable and effective!

## **Discussion**

The questions we set out to answer with this research concern (1) the efficacy of the EL program in terms of student learning, and (2) the value of instructor encouragement as a motivator of student engagement and success in the EL forums. Here, we discuss what we learned about each of those questions in turn.

### *Effectiveness of embedding*

Our findings showed that, taken in the aggregate, student knowledge of key information literacy topics increased from the beginning of the EL forum to the end. Although the precision and reliability of our results were hampered by a lack of pairwise data and an overall low response rate on the post-test, the aggregate change in score for each knowledge test question shows a dramatic enough change (12-point improvement in the test overall; 20-point improvement in the net-new questions alone) that general improvement seems unequivocal. A paired t-test also backs up the statistical significance of this result, indicating a less than 0.1% likelihood that the results are attributable to chance (even considering the small sample size).

### *Analysis of responses to pre-existing knowledge questions*

Q1: Discovery is the main search box on the Library homepage. What does it enable you to search?

Q2: When searching Discovery, how can you limit your search to peer reviewed articles?

Q1 and Q2 concerned the function of RRU Library's discovery layer. As all students had received previous instruction on these concepts in the introductory one-shots at the start of their program, they should in theory have been familiar with this material. Indeed, the mean pretest score for both questions was about 61% (and was likely substantially higher in reality for Q1—see the Data Analysis section “Issues encountered during scoring”). Participation in the forum increased performance on both questions by about 10 percentage points across all cohorts.

Given that, in theory, all participants should have known the answers to these questions before the forum started, if anything it is perhaps surprising how *low* these pretest scores were. These findings suggest that covering detailed aspects of searching during an introductory session may be premature for some students—this type of tip might not stick unless it is provided in

context (i.e., “just in time”: when the cohort is working on an assignment that requires literature searching). This does not necessarily mean this type of information should *not* be covered in intro sessions, but it does reinforce that information may need to be given more than once, and within a relevant timeframe, in order to resonate for all students.

### *Analysis of responses to net-new knowledge questions*

Q3: What is the advantage of using quotation marks in your searches, for example "oil and gas"?

Q4: When searching for literature on a topic that can be described in more than one way - for example, “adolescence” / “adolescent” - how can you look for both at once?

Q3 and Q4 addressed more advanced elements of keyword searching, which RRU students do not receive formal instruction on until the EL forum (although of course they may have learned the techniques in previous post-secondary programs, through self-study, or in an individual appointment with a librarian). Assessing pretest scores on Q3 and Q4 thus helps us interrogate our core curiosity about the value of the EL program. Large increases in scores for these questions (a 21-point increase from pretest to post-test) reinforce the conclusion that students are learning in the EL forum. Still, there's room for improvement, as participation in the forum did not move students' understanding of these concepts above 66%.

The knowledge-check question on which students showed the biggest improvement was Q4. This was also the lowest-scoring question on both the pretest and the post-test universally and dramatically, with an average cross-cohort score of 23% on the pretest and 49% on the post-test. This represents a 26-point increase, but still a failing grade.

When we unpack the specific responses given to Q4 on the pretest, they paint an interesting picture of students' prior knowledge. While about 33% of respondents answered



something like “Don’t know” or left the question blank, roughly 44% attempted an answer, but the answer was wrong. The wrong answers provided are illustrative: frequent suggestions included “or” (not in capitals), AND or AND/OR, or other types of syntax.

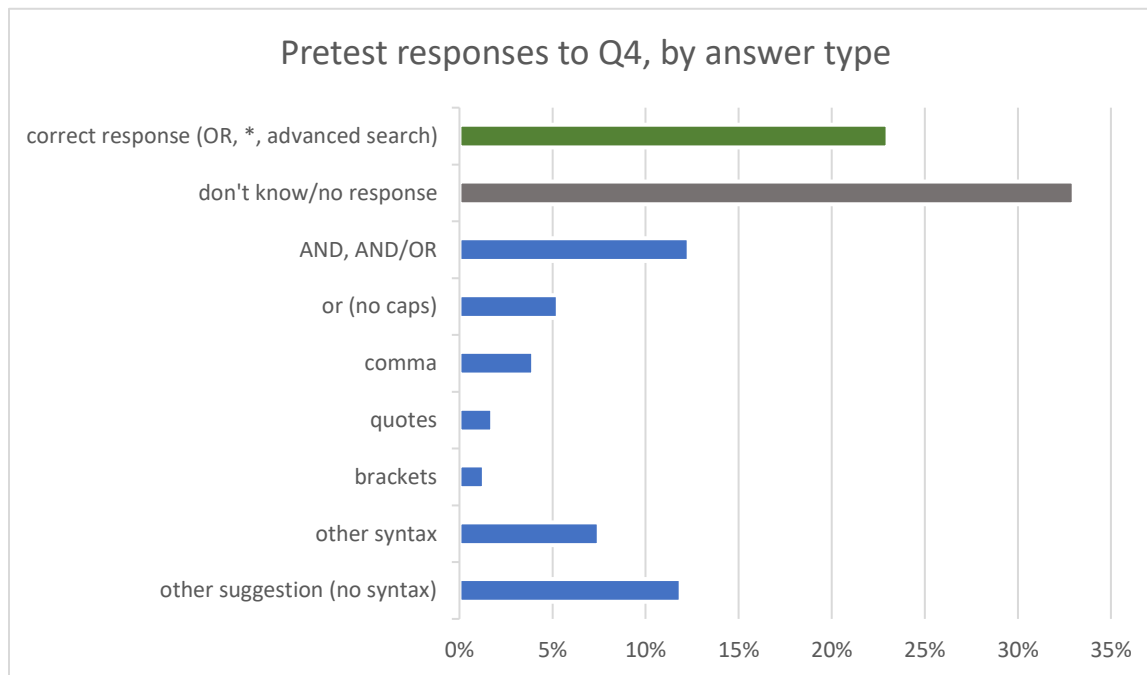


Figure 6. Percentage breakdown of pretest responses to Q4 by response type.

This pattern of incorrect responses suggests that the majority of our students are coming into the forum with some previous exposure to the concept of Boolean operators and other advanced search techniques. However, their knowledge appears to be vague and conceptual—somebody told them some time that they could use syntactic expressions to increase their search precision, but they’re not clear on exactly how to do that. Thus, it is likely that most students are either avoiding using these techniques in their searching prior to the embedding or are using them incorrectly (thus likely increasing their frustration).

Unfortunately, much of this confusion remains in the post-test, with a similar number of students giving near-miss responses; however, a much higher percentage were able to answer

correctly. Perhaps a saving grace here is that, if students departing the forum attempt to use the wrong syntax and receive a confusing response from the search system, the forum posts remain available to them to revisit and refresh their understanding.

### ***Value of instructor encouragement as a motivator***

Many studies of embedded librarianship mention the importance of instructor buy-in for the success of these programs (Aquila & Wolfe, 2023; Charles & DeFabiis, 2021; Franzen & Sharkey, 2021; Freeman, 2020; Harkness et al., 2021; Sullivan & Porter, 2016). Instructor engagement with the EL program is seen as a key factor not just for getting the librarian “in the door”, but for the success of these programs in the long run in terms of student engagement and learning (Aquila & Wolfe, 2023). Yet the evidence marshaled to support this claim seems limited to anecdotal observation and common sense. In the second part of our study, we set out to measure the connection between instructor encouragement and student engagement and learning.

To measure this relationship, we conducted a number of  $R^2$  regression analyses, as described in the Findings section “Instructor encouragement as a predictor of student engagement and learning”. These tests indicate that student engagement with the forum and student learning during the form are both positively influenced when the course instructor takes time to talk up the forum and encourage students to participate. In the case of student performance, nearly 50% of the variation in students’ score increases from pretest to post-test can be attributed to stronger positive messaging by the course instructor. In the case of student engagement, it appears that students simply don’t engage with the forum unless the instructor invites and encourages them to do so.

The discrepancy between the magnitude of effect in these two cases—i.e., the fact that instructor encouragement has a stronger effect on student learning than it does on student engagement—speaks to a known information gap for RRU librarians embedding in Moodle forums: we never really know how many students are paying attention to what we share. In their (2014) paper, Meredith and Mussell highlight the assessment limitations that arise from Moodle’s “auto subscription” feature, which means that students automatically receive new forum posts as email digests and do not need to visit the forum “in person” to read the information shared by the librarians. This helps us reach a wider range of students but limits our ability to assess participation as we cannot know how many students are opening and reading those emails.

The correlation between instructor encouragement and student performance suggests that many more students are responding to that encouragement by engaging passively with the forum (by reading and absorbing the librarian’s posts) than are taking the time to comment and engage directly in the forum discussion. This finding may be frustrating for librarians who sometimes feel they are speaking into a void when running forums for unresponsive cohorts, but it can also offer reassurance that our words resonate even through that void.

The strong correlation between instructor encouragement and student performance puts an exclamation point beside the well-trod adage in the librarianship literature about the importance of allying and collaborating with faculty during information literacy instruction. Our results show that faculty buy-in is not simply a “nice to have” but, at least in the case of embedded librarianship at RRU, a direct contributor to student learning and success.

## **Limitations**

There were limitations baked into this research both intentionally and unintentionally, most of

which have been described in context above. The robustness of our reporting was limited by our decision not to track IP addresses across pretest and post-test and a generally low response rate on the post-test. Not running a pilot test meant that two of our test questions yielded broader (Q4) and/or less robust (Q1) results than we had hoped. Note also that because our post-test was administered immediately following the forum, we were able to measure only immediate recall, rather than long-term retention of information.

Furthermore, due to the loosely controlled nature of the test environment, we cannot know for certain whether students did the pretest and post-test in the right order. In particular, it's possible that some students had already read one or more forum posts before completing the pretest. We attempted to limit this behavior by posting the pretest link at least 24 hours before the first substantive information literacy post and asking students to read the posts sequentially, but we had no way to ensure this request was followed.

We also did not interrogate or control for students' previous exposure to library instruction. Although our scheduling practices make it highly unlikely that students would have participated in a previous embedded forum, some students may have received detailed one-on-one instruction through our reference service. As well, students come to RRU programs with highly variable research backgrounds: many hold a bachelor's degree from 20 years earlier, some have recently completed an advanced degree, and those entering through flexible admissions may have no previous experience in academia.

## **Conclusion**

The results of this study indicate that the EL program at RRU is moderately effective at helping students learn essential information literacy concepts, and that that effect is significantly increased when the course instructor takes the time to actively encourage students' participation

in the forum. The findings also indicate some potential areas for improvement.

Student score increases on known-information test questions (Q1 and Q2) reinforce the importance of repetition when teaching information literacy concepts. Even though the test participants had already been given the information for Q1 and Q2 during an earlier library instruction session, their scores still showed improvement over the course of the forum. This finding underlines the importance of moving beyond one-shot instruction where possible, and of scaffolding instructional content between sessions: there's value in hearing the same information more than once.

Additionally, some concepts in information literacy are complex enough that passive information transmission is an insufficient learning mechanism. The scores for Q4 (Boolean operators), in particular, were pretty dismal even on the post-test, and the array of responses to this question suggests that the concept is confusing for students and bears a more scaffolded approach. Introducing a hands-on learning activity in the form of an interactive tutorial may be a straightforward way to help students get practice with this or other information literacy concepts within the scope of the forum. Moodle supports the integration of h5p activities directly into forums. Although building these activities requires an up-front time investment, after the activity is built it can be readily reused across many different contexts, thus keeping the demand on the librarian low while hopefully increasing student understanding and retention of key concepts.

Finally, our findings provide evidentiary weight to the frequent claim in the librarianship literature that faculty involvement is paramount to the success of EL programs. The importance of robust librarian–faculty relationships echoes strongly in the literature on embedded library service, but we have found no other research in the field that sought to objectively measure faculty influence on librarian success. We found a significant, measurable connection between

faculty encouragement and student success in the RRU context; we believe the method we used could readily be extended to examine the strength of this relationship in other institutional contexts.

Of course, it's one thing to know that faculty investment in information literacy instruction is important and it's a very different thing to successfully communicate that importance to busy, overworked faculty. Results from studies like this one, offering concrete evidence of the connection between instructor encouragement and student success, may help to move that needle. Presenting faculty with hard evidence that their input and encouragement matters to student success will hopefully have a buoying effect on their motivation to promote our work to students.

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**Appendices:**

Research instruments and consent

Notes on sentiment scoring

Scoring rubric for knowledge check questions

## **Appendix A: Research instruments**

### *Pretest questions*

- What program are you in?
- Q1: Discovery is the main search box on the Library homepage. What does it enable you to search?
- Q2: When searching Discovery, how can you limit your search to peer reviewed articles?
- Q3: What is the advantage of using quotation marks in your searches, for example "oil and gas"?
- Q4: When searching for literature on a topic that can be described in more than one way - for example, 'adolescence' / 'adolescent' - how can you look for both at once?
- Is there anything in particular you are hoping I will talk about in this Librarian forum?

### *Posttest questions*

- What program are you in?
- Q1: Discovery is the main search box on the Library homepage. What does it enable you to search?
- Q2: When searching Discovery, how can you limit your search to peer reviewed articles?
- Q3: What is the advantage of using quotation marks in your searches, for example "oil and gas"?
- Q4: When searching for literature on a topic that can be described in more than one way - for example, 'adolescence' / 'adolescent' - how can you look for both at once?
- Please rate the usefulness of each of the following posts in the Ask a Librarian forum. 1 = not at all useful; 5 = extremely useful.

- Overview of research tools
  - Example of how to build a search
  - Considering scholarship as a conversation
  - Finding the full text
- Overall value of the Ask a Librarian forum at improving your library research skills.
  - What feedback do you have on how this 'Ask a Librarian' forum could have been more useful to you?

**Appendix B: Knowledge check questions answer key**

Q#	Question	Correct answer must include	Scoring notes
Q1	Discovery is the main search box on the Library homepage. What does it enable you to search?	This will be interpreted generously, as the question was too open-ended. Award full points to any variation on: “The RRU collection” OR print and digital OR books and articles	Exclude answers that are direct quotes from our website (indicates this was not part of the student’s knowledge)  0 for answers that don’t mention the collection or include items we don’t index  0.5 to answers missing a key element (e.g., just “academic articles” or just “books” or just “print materials”)
Q2	When searching Discovery, how can you limit your search to peer-reviewed articles?	Award point if answer includes: Checkbox in the filter menu OR Advanced search	
Q3	What is the advantage of using quotation marks in your searches, for example “oil and gas”?	Award point if answer includes: Exact phrase searching	

Q4	When searching for literature on a topic that can be described in more than one way – for example, “adolescence” / “adolescent” – how can you look for both at once?	Award point if answer includes: Capitalized OR OR Truncation, *, stemming Advanced search	0.5 for answers that mention “AND/OR” or “or” (not capitalized)
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### Appendix C: Sentiment scoring codebook

The sentiment scoring rubric for this paper was adapted from ‘AFINN Sentiment Analysis’, developed by Finn Arup Nielsen and [available on Github](#).

- Words were awarded values from minus-five for very negative sentiments to positive-five for very positive sentiments. The word, ‘support’, for example, is valued at + 2. The full range of scoring was 10 (-5 to +5).
- Only words that imply sentiment about the library, the librarian’s forum, or the librarian were scored. For example, although ‘please’ has a value of +1 in the AFINN taxonomy, it was ignored for this study since it did not assign value of the library, the library form, or the librarians.
- Points were awarded every time a word was used. For example, if the word, ‘support’ was used two times in single block of text, the combined score for that word was 4.
- Coded words that were not already part of the ‘AFINN Sentiment Analysis’ taxonomy were assigned point values in alignment with point values already in the taxonomy. All the words scored in this study, and their point values, are listed here.

## *Codebook with assigned values*

Additional words that provide essential lexical context for the taxonomy word are included in round brackets. Coder notes on the thought process involved in scoring a particular word are included in square brackets.

Active: 2  
Access: 1  
    Access problem: -1  
Accelerate (your research): 3  
Active: 2  
Acquire skills: 1  
Address any questions: 1  
Advantage: 2  
Advice: 2  
Alleviate (stress): 2  
Allows for: 1  
Already posting (the librarian is): 1  
Amazes / Amazed: 2  
Amazing: 4  
Answer (any questions): 1  
Appreciate: 2  
Approach: 1  
Arrived (the librarian has): 1  
Ask questions (you can): 1  
Assist / Assistance: 1  
Attention: 1  
Available: 1  
    Always available: 2  
Benefit: 2  
Best: 3  
Beyond (this course): 3 [there are other ways this future applicability is expressed, too, all coded to 3]  
Breadth (of knowledge): 3  
Brief time: 1  
Broadening (search terms): 2  
Browsing: 2  
Building (skill): 1  
Challenges: -2  
Chance: 2  
Conceptual (approach): 1  
Conduct / conducting: 1  
Consult: 1  
Contact (the library): 1  
Combines: 2  
Confident (that the librarian can help): 2  
Confidentiality agreements [that the librarians signed them prior to course]: -2  
Created: 2 [it's more active in its implication that 'availability']  
Critical (to the success of your work): 5  
Description: 1  
Determining (search terms): 2  
Difficulties: -1  
Discussion: 2  
Easy-to-follow: 1  
Effectively: 2  
Efficiency:  
Email the librarians [directions to do this]: 2  
Encourage: 2  
    Strongly encourage: 3  
Engage: 2  
Enjoy: 2  
Evaluating: 2  
Excellent: 4 [on par with 'wonderful']  
Expertise: 3  
Explain: 2  
Far beyond this course (forum will be useful): 3  
Feedback: 2  
Find / Finding: 2  
    Can't find: -2  
Focused: 3  
Follow (forum posts): 1  
Future: (forum will help you complete future assignments successfully): 3  
Gear up: 1  
Generous: 4  
Generosity: 4  
Great: 4 ['good' gets 3 and 'wonderful' gets 4. Great is closer to wonderful]  
Grateful: 3  
Growing (collection of resources): 2  
Good: 3  
Guidance / Guide: 2  
Handy: 2  
Help: 2  
    Very helpful: 3  
Hosting (a forum): 1  
Improving: 3  
Information: 1  
    Rich information: 2



Info-rich messages: 3  
Insights: 2  
    Valuable insights: 3  
Interacting: 1  
Interactive: 2  
Invaluable: 4  
Involvement: 2  
Join: 1  
Knowledge: 2  
    Great knowledge: 3  
Leadership: 1  
Leading: 1  
Lead the discussion: 1  
Learn / Learning: 2  
Learning community: 2  
Looking forward: 2  
Loving: 3  
Luckily (we have the librarian here): 3  
Manage / manageable: 1  
Marked list: 2  
Mentorship: 2  
Moderate: 2 [verb seen to be on par with  
'guidance']  
Monitor / monitoring: 1  
Move forward: 2  
Multitude: 3  
Navigate: 2  
Narrowing (searches): 2  
Not answered: -1  
Not sure: -1  
Opportunity: 2  
    Great opportunity: 3  
    Amazing opportunity: 4  
Organize (the library collection): 2  
Outreach: 2  
Participate / participating: 1  
Please: do not score  
Pleased: 2  
    Very pleased: 3  
Point of need (as in point of need support): 2  
Post (as in, 'post to the forum'): 1  
Preliminaries: 1  
Provide / Providing: 1  
Problems: -1  
Questions: 1  
Raise: 2  
    Significantly raise: 3  
Reaching out: 1  
Refining (search terms): 2  
Relevant: 2  
Reminder (about the forum): 2

Respond / response: 1  
Resources: 1  
    Full range of resources: 2  
    Amazing resource: 3  
Retaining: 2  
Retrieve: 2  
Required (participation is required): -2  
Rich (the library is a rich resource): 3  
Run (the forum): 1  
Searches / Searching: 1  
Searchable: 2  
Seize (the opportunity): 2  
Serve you well: 1  
Services (library services): 1  
Share / Sharing: 2  
Show: 1  
Research skills: 2  
Slow: -2  
Staff ('will staff this forum'): 1  
Standing by: 1  
Strategies / search strategies: 1  
Structuring (searches): 2  
Struggle / struggling: -2  
Successfully: 2  
Suggesting: 2  
Support: 2  
    Excellent support: 3  
Sure: 2  
    Not sure: -2  
Teach: 2  
Thrown ('a lot of info thrown at you'): -3  
Tips: 2  
Tips and tricks: 3  
Tutorials: 1  
Use (this forum / the library): 1  
Useful: 2  
Valuable: 3  
    Extremely valuable: 4  
Variety of ways ('librarians can help in a'): 2  
Walk through: 2  
Welcoming / welcome: 2  
Will be useful through your degree: 3  
Will be online / Will staff this forum: 1  
Willingness (to help): 2  
Wise / Wisdom: 3  
Wonderful: 4  
Working with us: 2  
  
[Directing to other university library]: -3  
[Recommending that students ask the instructor  
for research help]: -4