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A Qualitative Analysis of Library Chat Reference Transcripts: Examining Engineering Student Queries within the Information Seeking Process

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Abstract

Academic libraries play a pivotal role in supporting engineering students' information needs. Understanding the intricacies of information-seeking behaviors among engineering students is crucial to enhance the effectiveness of engineering librarianship and, more broadly, engineering education. This research paper presents a qualitative analysis of library chat reference transcripts from engineering students, with a primary focus on evaluating the alignment of their questions with an established information-seeking model.

The study applies Kuhlthau's Information Search Process, a well-established framework of information seeking. Using process coding, a one-year dataset of chat reference interactions from a large research university is examined to uncover patterns and trends in the types of questions posed by engineering students and evaluate how the Information Search Process model aligns with the actual behaviors of engineering students.

This research illustrates how data—in this case chat reference transcripts—collected on a regular basis by academic libraries can be utilized to provide empirical evidence of how engineering students navigate the complex landscape of information seeking. The study's outcomes are of particular relevance to librarians, educators, and researchers in the field of engineering education, as they strive to enhance the information literacy skills of students and ensure that library reference services are well-aligned with their information-seeking behaviors. This research serves as a foundation for future investigations and improvements in library services, ultimately supporting the academic success and information literacy development of engineering students.

Introduction

The term "dark data" has been used to describe the vast amounts of data regularly collected and stored by organization but that remain unused, often due to a lack of capacity to evaluate the data or a lack of knowledge of its existence [1]. In this sense, libraries collect a large amount of dark data. Circulation statistics, gate counts, and chat reference transcripts are examples of data collected and stored during the everyday operations of libraries, but that often go unused or unanalyzed, except perhaps in the most basic way. Dark data is distinguished from "tangible data," the data of which researchers are aware and are able to use [1]. This study attempts to convert a small amount of the information collected by an academic library from dark data to tangible date.

Arizona State University (ASU) provides an Ask a Librarian service through which students, faculty, researchers, and the public may interact with a library personnel, both librarians and paraprofessionals, through live chat to answer questions ranging from the simple (when is the library open?) to complex (I would like to perform a literature review about the use of electronic research notebooks in engineering capstone courses). While simpler questions are often resolved during the initial chat session, more complex questions are routed to one of multiple queues depending on the chat operator's assessment of the question. The queues are organized by disciplinary area (e.g. STEM, Social Sciences, Humanities) and function (e.g. Data Science, Researcher Support). The students' reported school affiliation may weigh into the assignment of a queue, but is not dispositive.

These chat transcripts are saved and retained by ASU Library, but they have not been analyzed other than as a quantitative count to illustrate the number of patrons serviced. This study uses these previously unanalyzed chat transcripts to see if any insight into engineering students' information seeking behavior can be gleaned. It illustrates a technique that could be applied in other disciplines and at other institutions to gain a better understanding of students' research habits and research needs in order to better strategically deploy library resources.

Background

The use of chat transcripts as data

Using chat reference transcripts as an evaluation or assessment tool is not a novel idea. For example, several studies have utilized chat transcripts to evaluate how libraries respond to their patrons. Librarians have used examinations of chat transcripts to judge the quality of paraprofessionals' interactions with patrons and support the triage reference-services model where frontline staff evaluate patrons' questions before involving librarians [2], to generally evaluate the overall quality of their chat services and identify teaching moments [3], and to inform staffing and training needs to best serve the patrons who use chat [4]. Some studies described specific changes that were undertaken in response to the qualitative evaluation of chat transcripts, but those focused on improving training to the librarians and modifying passive assistance methods such as LibGuides and online tutorials [5].

Recent studies involving chat reference transcripts have also explored general classifications of question types [6], compared chats from on-campus and off-campus students [7], distinguished between the needs of chat users based on the origin of their questions [8], and examined what types of chat services are required during a crisis, such as the COVID pandemic [9].

Many evaluations of chat reference transcripts are quantitative in nature, aided by the many categories of information collected automatically by chat reference software and by the convenient nature of being able to picture usage statistics or classify the types of questions numerically. These studies include applying a novel statistical test to gauge the impact of chat reference on other reference modes [10], examining the subjects of questions predominantly asked through chat [11], and using patron questions to gauge the effects of changes to a library's access requirements, to student tutorials, and to the library building itself [12].

One quantitative study performed a comprehensive review of all chat transcripts received by the University of Washington during a single academic quarter and rated each questions using a modified Reference Effort Assessment Data (READ) scale [13]. Of note, this study examined differences between undergraduate and graduate students—finding undergraduate questions required more complex answers—and examined the complexity of questions during the progress of the quarter—finding that the complexity of questions peaked at week six of the quarter [13]. Although this study did not focus exclusively on engineering students, the general nature of the study suggests that engineering students may display similar trends.

A number of analytic methods have been applied to chat transcripts. These include using conditional statements in Excel [12], automated evaluation using regular expressions [14], natural language processing to code chat transcripts [15], and machine learning to predict the difficulty of chats [16]. Automated topic modeling has also been proposed as a method to better classify chats, particularly where access to both the librarian's and the patron's inputs are available [17].

A 2011 systematic review of research concerning live chat services in libraries, examined studies of chat reference service between 1995 and 2010 [18]. Notably, one suggested area for future research concerned an examination of how the need for instructional interventions for students could be identified through chat transcripts [18].

Information seeking behaviors of engineering students

Although information seeking behaviors of engineers and scientists have been explored and modeled in the workplace [19], [20], a recent scoping review concluded there was a significant gap in the literature about engineering students due to the small number of studies uncovered [21]. They similarly identified the lack of a consistent methodology under which to examine this information seeking behavior [21]. Despite this, there is still a sufficient body of research to inform this study.

When focused specifically on engineering students, studies about information seeking behavior have examined design-related courses [22], tasks [23], or scenarios [24]. These studies used both quantitative and qualitative methods to trace the evolution of information use over time by undergraduate engineering students [25] and their conception of engineering skills [24]. Qualitative methods have been used to explore the information literacy of engineering students in studies that explore information practices of first generation students [26] while mixed methods studies have compared the information seeking behavior of engineering students with professional engineers [27]. No study that used chat reference transcripts to specifically examine the behaviors of engineering students was discovered during a literature search, suggesting the approach described in this study is a novel application.

Theoretical Frameworks

To model the information seeking behaviors of students, librarians use both general [28] and specific [29] paradigms to model the process. One of these general models in common usage is Kuhlthau's Information Search Process (ISP) Model which breaks the process of information-seeking into six stages [28]. The stages are identified through the researchers' actions and are linked with their feelings toward the search process and their thoughts about the research topic [28].

Stage	Associated Activities	Associated Tasks
Initiation	Actions: Seeking background information Feelings: Uncertainty Thoughts: General/Vague	Kuhlthau task: Recognizing information need Group task: Gather
Selection	Actions: Seeking background information Feelings: Optimism Thoughts: General/Vague	Kuhlthau task: Identifying general topic Group task: Gather
Exploration	Actions: Seeking relevant information Feelings: Confusion/Frustration/Doubt Thoughts: General/Vague	Kuhlthau task: Investigate information on general topic Group task: Gather/Complete
Formulation	Actions: Seeking relevant information Feelings: Clarity Thoughts: Narrowed/Clearer	Kuhlthau task: Formulate focus Group task: Gather/Complete
Collection	Actions: Seeking relevant or focused information Feelings: Sense of direction/confidence Thoughts: Increased interest	Kuhlthau task: Gather information pertaining to focus Group task: Complete
Presentation	Actions: Seeking relevant or focused information Feelings: Relief/satisfaction or disappointment Thoughts: Clearer or focused	Kuhlthau task: Complete information search Group task: Write or present

Figure 1 – Levels of the Information Search Process along with activities and tasks indicative of each level. [28]

The six stages in the ISP, summarized in Figure 1, are:

- *initiation*, when the researcher is looking for background information and feels uncertain or apprehensive about the research process;
- *selection*, when the researcher settles on a general topic, creating a sense of optimism, but is still uncertain about their level of knowledge;
- *exploration*, the researcher broadens their search, but may find conflicting information or run into "dead ends," shaking their confidence, perhaps daily [30];
- *formulation*, where the researcher increases their clarity about both their research topic and the evidence supporting it;
- *collection*, in which the researcher, buoyed by their clarity of purpose, collects specific information and deeper resources about their topic; and
- *presentation*, when the research is completed (at least for this task) and the researcher is ready to put their knowledge to use through publication, presentation, or other means[28], [29].

The ISP has been applied to engineering students to guide the development of interview questions in an qualitative examination of the differences between beginning and advanced students' understanding of information skills [24]. In that study, a semi-structured interview framework was used in discussions with beginning engineering students (identified as first- or second-year undergraduate students) and advanced engineering students (identified as final-year undergraduate or graduate students) [24]. A thematic analysis of the interviews revealed five broad themes underscoring the differences between the two groups of students: awareness of information needs, strategies for searching, extraction of information, sufficiency of information, and organization of information [24]. This difference between students who are earlier in their educational career and those who are more experienced is echoed in a study showing undergraduate engineering students exhibit a change in the use of information over time, using sources such as technical reports and journal articles more as progress from their second to fourth year of study [25].

Research Questions

This study explored two research questions:

- RQ1. Do the chat transcripts from undergraduate and graduate engineering students reveal differences in the complexity of their research questions based on their location in the ISP?
- RQ2. Do the chat transcripts from undergraduate and graduate engineering students reveal trends in the complexity of their research questions over the course of a twelve-month period encompassing a full academic year?

The ASU Institutional Review Board (ASU IRB STUDY000018545) determined this research was exempt pursuant to 45 CFR § 46(2)(ii) on September 19, 2023.

Methodology

Data source and collection

ASU's Ask a Librarian service uses the LibAnswers platform from Springshare to provide both live and asynchronous chat services for library patrons. This study examined chat reference transcripts that were generated through two primary entry points: live chat reference conversations and asynchronous email reference requests.

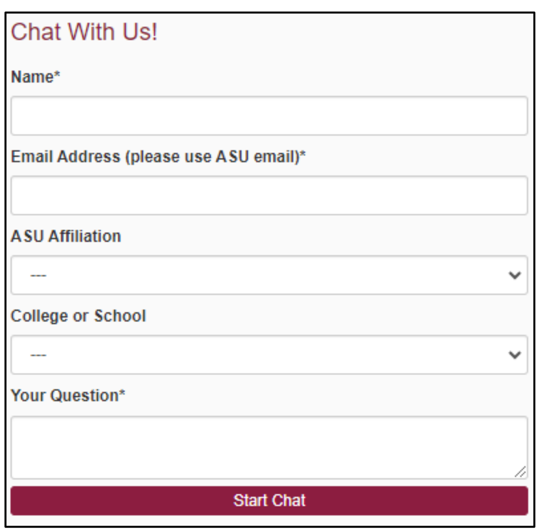

Figure 2 – Patron interface for initiating a live chat reference session.

With respect live chat reference, when the user initiates a live chat with the library they are asked for some basic information before beginning their chat session. As illustrated in Figure 2, this consists of their name, email address, affiliation (undergraduate, graduate, faculty, staff, alumni, non-ASU, other), college or school (a list of twenty options including the Ira A. Fulton Schools of Engineering), and their question. Only the name, email, and question are required fields. All information is self-reported by the patron and is not manually or automatically verified.

Figure 3 shows that, with respect to the email submissions, the patrons are asked for more information than the live chat form and the fields for affiliation and college or school are now mandatory. Patrons may also add additional detail and explanation to their questions, may upload files, and may list a specific department or course, though the option to upload files or list a specific course was not used by any of the students in this study. For both live chat and email interactions, patrons may rate the interaction on a one to four scale.

In addition to the patron-reported information, other data such as the date and time of the chat and the length of the interaction are automatically collected by the system. Table I lists all of the header tags that were supplied by the system when the chat transcripts were retrieved.

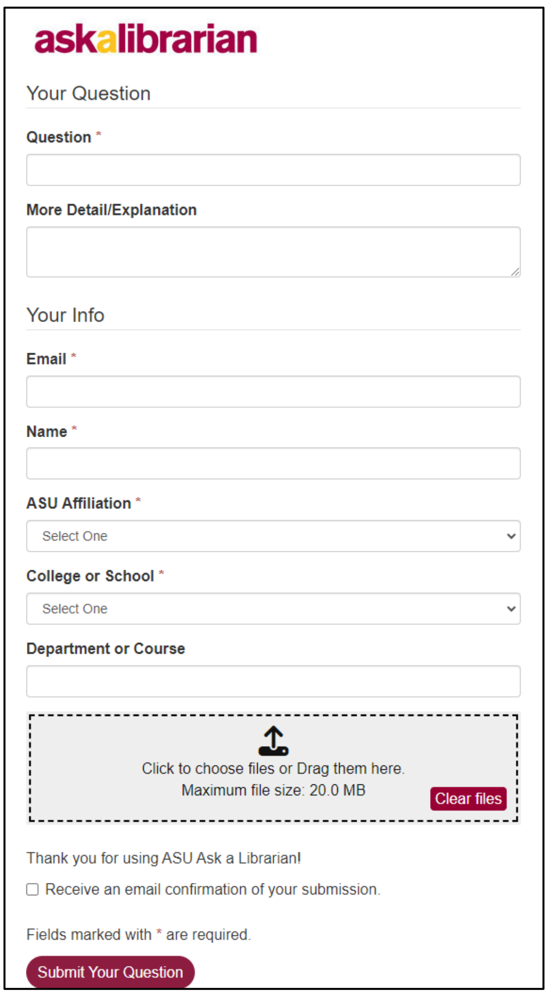

Figure 3 – Patron interface for initiating an email reference question.

TABLE I. DATA HEADERS AND DESCRIPTIONS

Data Header	Description
Chat ID	A unique identifier for each chat generated automatically by the system
Name	Patron name. Automatically deleted by the system 30 days after the chat.
Contact Info	Patron’s contact information, typically email address. Automatically deleted by the system 30 days after the chat.
IP	IP address for the patron. Automatically deleted by the system 30 days after the chat.
Browser	Patron’s browser and version.
Operating System	Patron’s operating system.
User Agent	Patron’s user agent.
Referrer	Website URL through which patron accessed live chat
Widget	Springshare widget through which patron accessed live chat.
Department	Library department tasked with answering the live chat. “Chat reference” for all values in this data set.
Answerer	Name of responding library personnel. Automatically deleted by the system 30 days after the chat.
Timestamp	Date and time of chat initiation.
Wait Time (seconds)	Time in seconds from initation of the chat by the patron until first response from library personnel.
Duration (seconds)	Total time from initiation of chat to closure or referral of the chat.
Screensharing	Binary field for whether screensharing was used during the chat; 0 indicating no sharing and 1 indicating sharing.
Rating (0-4)	Optional rating provided by patron after chat. Patron may select from 1 (low) to 4 (high) and no response is coded as 0.
Comment	Patron provided comment during rating period.
User Field 1	Unused field for this study. No data within field.
User Field 2	Patron’s self-reported role at ASU. Used to locate undergraduate and graduate students during this study.
User Field 3	Patron’s self-reported school at ASU. Filtered during retrieval to only include Ira A. Fulton Schools of Engineering.
Initial Question	Patron’s first question to intiate chat.
Transfer History	Records different users to whom the patron was tranferred during the chat. Automatically deleted by system 30 days after chat.
Message Count	Total number of messages between patron and library personnel.
Internal Note	Internal notes only visible to library personnel and not to patron.
Transcript	All interactions between patron and library personnel after initial question.
Tags	Optional tags added by library personnel to characterize chat. Not used in this study.
Ticket ID	Unique identifier provided to any tickets created during live chat.

Transcripts were retrieved from the system for the period covering August 1, 2022 through July 31, 2023. These dates were selected to include an entire year of data which roughly aligned with ASU's academic year, encompassing regular Fall and Spring semesters as well as Summer sessions for instruction. During retrieval the transcripts were filtered to only include responses from patrons at the Ira A. Fulton Schools of Engineering. The initial data set consisted of a total of 404 transcripts.

Data processing

Springshare downloads the transcripts in the form of a CSV file. The transcripts were loaded into Excel and then filtered by ASU Affiliation to limit the results to students. This resulted in 334 individual transcripts from the time period, or 82.7% of the original responses. Coincidentally, these were evenly divided between undergraduate (n = 167) and graduate students (n = 167).

The data were then reduced to only include the data headers of interest. The Initial Question and Transcript fields were merged into the Transcript field. The Chat ID field, originally a seven-digit identifier, was replaced by a field (Number) containing sequential numbers beginning at 1 for the earliest transcript and ending at 334 for the final transcript of the time period. All other data columns were removed with the exception of the Timestamp and User Field 2, which was renamed as Student_Level and now consisted of only two entries, Undergraduate or Graduate.

Because the transcripts still contained personal identifiers in the form of names, email addresses, student IDs, and phone numbers, OpenRefine was used to identify and remove identifying information. Names were often located by searching for the words "hi" or "hello" and then were removed globally as each one was found. Email addresses were located by searching for the @ symbol. Student IDs at ASU begin with a consistent number string and could be located in that manner while phone numbers were located by searching the words "phone" and "number." At this point, the anonymized and filtered data was ready for qualitative coding.

Qualitative coding

The transcripts (n = 334) were then reviewed using process coding. Process coding classifies qualitative data by identifying verbs and actions being performed and coding them using gerunds [31]. Process coding can be used for both simple, observable activities as well as more general, conceptual actions [31]. Because the ISP model uses researchers' actions as indicators of associated stages, process coding is appropriate choice for first round coding.

Coding took place over the course of several weeks. For this study the author was the sole coder, but discussed excerpts and coding with faculty and graduate students in the Engineering Education Systems & Design (EESD) department at ASU to gain better understanding of how the codes could be extracted from the data and to gather nuanced perspective from others. This first round of coding was performed inductively, with the text of each chat determining the relevant process code to identify the primary thrust and function of each chat interaction from the view of the student.

After the initial round of coding, closely-related codes were merged into similar codes for consistent analysis and definitions were developed to distinguish similar codes. For example, patrons frequently use the verb “looking” in several ways, such as looking for sources in a general sense, looking for a specific source, or looking for tools to help with organizing their information. In the initial round of processing coding, the process code would focus on the use of the verb “looking” and also include the subject of the verb to provide greater clarity. These uses of looking, however, represent different stages of the ISP, ranging from the exploration stage to the collection stage to the presentation stage. Thus, broader codes, distinguishing each stage, needed to be created and defined. Table II provides examples of “looking” being merged into broader codes.

At that point, a second round of coding was undertaken using a deductive coding method where each first-level code was assigned to one of the stages of the ISP. In addition to the six stages of the ISP, a seventh second-round code was added, “Outside Model,” to represent a large number of questions that did not fall clearly into one of the ISP stages. These questions predominantly dealt with operational matters regarding the library, such as opening hours, locations, and policies. Table II also illustrates how process codes were mapped to stages of the ISP.

Each process code, and their associated second-level code (the ISP levels), were then associated with the transcript ID, and a final Excel file was uploaded for graphical analysis into R Studio for visualization using R. A full set of codes with definitions is included in the Appendix.

Limitations

The study contains several limitations some of which can be remedied through subsequent studies. One limitation is the time period of the data. While using only one year of data did provide several chat interactions, additional years of data could provide further evidence of cyclical variations from year-to-year as well as additional chat interactions that cover levels of the ISP with fewer data points.

TABLE II. EXAMPLE OF CODING PROCESS USING DIFFERENT MEANINGS OF “LOOKING”

Excerpt from transcripts	Initial code	Merged code	ISP level
I am *looking* for a laptop to accomplish my research goals.	Looking for laptop	Using technology	Initiation
Basically, I am *looking* how to come up with a specific research question.	Looking for research question.	Finding topic	Selection
I am *looking* for information about how the feel/touch of paper is essential to the industry in the digital age.	Looking for information	Finding resources	Exploration
I am *looking* for this article. Please see the citation below.	Looking for article	Accessing article	Collection
Looking for a conference room	Looking for room	Reserving room	Outside model

The use of chat transcripts is a form of convenience sampling, which self-selects for students who are aware of and use the live chat service. It does not include students who are unaware of that Ask a Librarian service nor students who are aware of the service but choose not to use it for whatever reason.

Finally, this study uses only the ISP as a theoretical model of information-seeking behavior and therefore is limited by using only that single lens to examine the data. Other models of information-seeking behavior, such as the Ellis and Haugan model [20], could be used as a framework for additional coding to compare the applicability of models to engineering students.

Discussion

Tables III and IV provide summaries of the codes observed for each ISP level during chats with students from August 2022 through July 2023. More codes are observed than the total number of chats because some chats contained more than one primary question that could be coded. The total number of codes at each ISP level by month is presented and each table also includes a subtotal for both the fall semester and the spring semester. Because the semesters' start and end dates were not coincident with the first or last day of a month, the monthly totals do not necessarily add up to each semester's total.

TABLE III. GRADUATE CHATS BY LEVEL AND MONTH

Month	Initiation	Selection	Exploration	Formulation	Collection	Presentation	Outside Model	Total
Aug 22	4		12	1	3	2	8	30
Sep 22	1		4	1	7	2	5	20
Oct 22	1			1	5		2	9
Nov 22	1		2		8		10	21
Dec 22					1		1	2
Jan 23				2	14	1	5	22
Feb 23				1	5		4	10
Mar 23	1		1	4	5		3	14
Apr 23					4	1	4	9
May 23			2		1		3	6
Jun 23			1		3		3	7
Jul 23	1		2		9	1	10	23
Fall Semester	7	0	18	3	24	2	24	78
Spring Semester	1	0	1	7	28	2	16	55
Total	9	0	24	10	65	7	58	173

TABLE IV. UNDERGRADUATE CHATS BY LEVEL AND MONTH

Month	Initiation	Selection	Exploration	Formulation	Collection	Presentation	Outside Model	Total
Aug 22	2		3	1	4		2	12
Sep 22	1		16	1	2	1	6	27
Oct 22	4		10	2	4		8	28
Nov 22			1		7		4	12
Dec 22			2					2
Jan 23	2		7	1	7		1	18
Feb 23	2		5	1	5	1	2	16
Mar 23	3		4	5	10		4	26
Apr 23			13	2	9	1	6	31
May 23		1	3		1		1	6
Jun 23			1		2		2	5
Jul 23	1		7		1	1	3	12
Fall Semester	7	0	31	3	15	1	19	76
Spring Semester	7	0	29	9	31	2	13	91
Total	15	1	72	13	52	3	39	195

In total, graduate chats resulted in fewer codes (*n* = 173) than codes derived from undergraduate chats (*n* = 195), despite both populations having the same number of chats (*n* = 167). Also notable, the undergraduate enrollment in 2022-23 (*n* = 21,370) of the Ira A. Fulton Schools of Engineering is approximately two-and-a-half times the graduate enrollment (*n* = 8,646) [32]. This suggests that graduate students are using chat at a greater frequency than undergraduates but that undergraduates on average ask slightly more questions that graduate students per interaction.

The data also revealed that over the course of the year undergraduates asked three times as many questions at the Exploration level (*n* = 72) as graduates did (*n* = 24), while graduate students asked more questions at the Collection level (*n* = 65) that the undergraduates (*n* = 52). These two levels represented the majority of questions asked during chats, and the higher number of questions at the higher level of the ISP suggests that graduate engineering students are asking more complex research questions than undergraduate engineering students. This observation is consistent with the University of Washington READ study which used a different methodology to conclude that graduate students' reference questions are more complex than undergraduates' questions [13].

Examining the data with an eye to differences over time, we can also see in Tables III and IV that there are some variations in the numbers as the academic year progresses. When plotted over time, these patterns are more easily visualized, as illustrated in Figure 4.

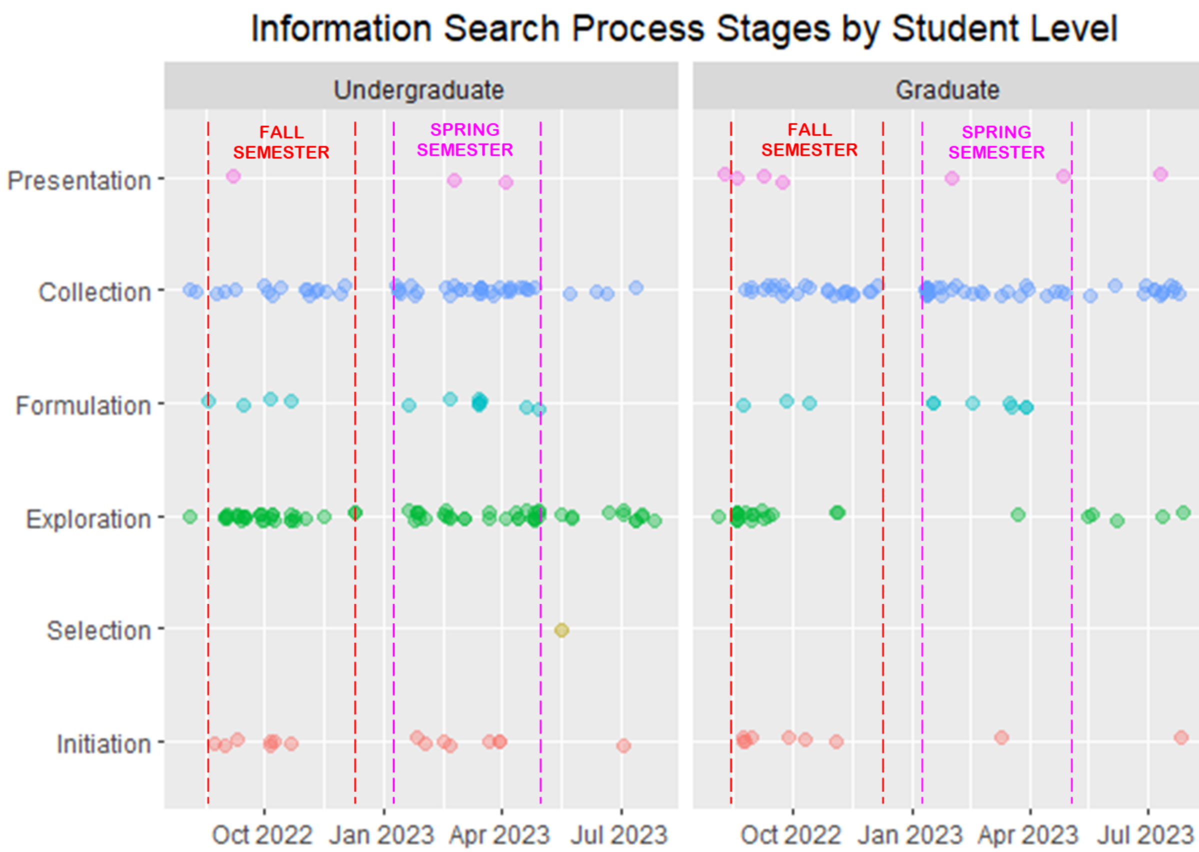

Figure 4 – Illustrating the differences between undergraduate and graduate engineering students across the academic year.

Reviewing Figure 4 in more detail reveals several interesting observations from the data. First, the general trend that interactions with graduate students exhibited higher levels of information seeking behavior than undergraduate students is observed through the larger number of chats at the Collection level among the graduate engineering students and the much higher number of chats at the Exploration level among undergraduates. Graduate students also appear to be more active at the higher level during the summer as well.

Second, the undergraduate engineering students do show an increase in the level of their questions as the academic year progresses, as more questions at the Collection level are observed during the spring semester than the fall semester. This underlines the University of Washington study that found information literacy questions become more complex as the academic session progressed [13].

One interesting cluster involves questions at the Exploration stage. While Exploration activities by undergraduates spread across both semesters, Exploration activities by graduate students occurred primarily around the beginning of the Fall semester, suggesting incoming graduate students would benefit from targeted library instruction about disciplinary-specific resources at the beginning of the academic year.

Three stages had less involvement with chat reference: Selection, Formulation, and Presentation. This is likely because these stages involve more introspection and thought on the part of the students. The students need to select their topic to move to the Exploration stage and then need to focus that topic to move to Collection. Exploration and Information Collection, the two stages with the most "searching" for information, represent the bulk of students' interaction with the library through online chat emphasizing the conception of the library as a place to obtain knowledge and resources.

Future Work

This study was successful in illustrating that chat transcripts, a ubiquitous source of data collected by academic libraries, are a ripe source of data about students' information seeking behavior. Additional work on this project will involve exploring additional years of data to detect longer-term trends along with a second phase involving semi-structured interviews with engineering students to see if their perceived experiences are in sync with the findings of this study.

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Appendix

TABLE A.I. DATA HEADERS AND DESCRIPTIONS

Second-round code (ISP Level)	First-round code (process code)	Description
Initiation	Using library	Asking about library services for the specific reason of supporting their research.
	Using makerspace	Asking about the library's makerspace for the specific reason of supporting their research.
	Using technology	Asking about technology available through the library for the specific reason of supporting their research.
	Visiting library	Asking about using library spaces for the specific reason of supporting their research.
Selection	Finding topic	Asking for help developing a research topic.
Exploration	Finding journal	Searching for an unknown journal to provide information in support of their research.
	Finding resources	Searching for unknown resources to provide information in support of their research.
	Finding archives	Searching for unknown archival holdings to provide information in support of their research.
	Finding article	Searching for unknown articles to provide information in support of their research.
	Finding book	Searching for unknown books to provide information in support of their research.
	Finding database	Searching for unknown databases to provide information in support of their research.
	Finding dataset	Searching for unknown datasets to provide information in support of their research.
	Finding peer reviewed material	Searching for unknown peer-reviewed material to provide information in support of their research.

Second-round code (ISP Level)	First-round code (process code)	Description
Formulation	Accessing software	Accessing specific software packages for the purpose of furthering their research.
	Constructing search strings	Requesting assistance on constructing better searches in databases for the purpose of furthering their research.
	Finding keywords	Requesting assistance on identifying better keywords for the purpose of furthering their research.
	Improving research skills	Requesting assistance to improve research skills for the purpose of furthering their research.
	Improving writing	Requesting assistance to improve writing skills for the purpose of furthering their research.
	Licensing software	Seeking licenses for specific software packages for the purpose of furthering their research.
	Locating citation tools	Requesting assistance with citation management software for the purpose of furthering their research.
	Verifying peer review	Verifying whether an already-discovered resource is peer reviewed.
Collection	Accessing article	Obtaining a specific article for the purpose of furthering their research.
	Accessing book	Obtaining a specific book for the purpose of furthering their research.
	Accessing book chapter	Obtaining a specific book chapter for the purpose of furthering their research.
	Accessing film	Obtaining a specific film for the purpose of furthering their research.
	Accessing paper	Obtaining a specific technical paper for the purpose of furthering their research.
	Accessing reference material	Obtaining a specific reference resource for the purpose of furthering their research.
	Accessing standards	Obtaining a specific engineering standard for the purpose of furthering their research.
	Accessing thesis	Obtaining a specific thesis or dissertation for the purpose of furthering their research.

Second-round code (ISP Level)	First-round code (process code)	Description
Presentation	Exporting data	Requesting assistance to export or permanently store data generated during research.
	Formatting citation	Requesting assistance to properly format citations for publication.
	Obtaining patent	Requesting information about obtaining patent for research.
	Storing item in repository	Requesting assistance to store research output in the institutional repository.
Outside Model	Accessing course material	Seeking material or textbooks for an academic course
	Asking for technology help	Seeking general assistance with technology and not for the specific purpose of research.
	Contacting bookstore	Seeking to contact the university bookstore.
	Borrowing technology	Seeking to borrow technology from the library and not for the specific purpose of research.
	Contacting staff	Seeking to contact library personnel and not for the specific purpose of research.
	Finding employment	Seeking a job at the library.
	Locating university information	Seeking general information about the library and not for the specific purpose of research.
	Locating place	Attempting to locate a specific location at the library or university and not for the specific purpose of research.
	Lodging concern	Lodging a concern or complaint.
	Printing	Seeking help or instruction with using a library printer.
	Removing fine	Seeking to remove a fine from the student's account.
	Renewing material	Renewing material already check out from the library.
	Reserving room	Reserving a study room in the library.
	Resolving fine	Wanting to pay a fine.
	Returning material	Needing instructions on how to return library material.
	Troubleshooting problem	Needing troubleshooting assistance.
	Using bus	Needing information about the intercampus shuttle.