Engineering Educators Bringing the World Together
2025 ASEE Annual Conference & Exposition
Palais des congrès de Montréal, Montréal, QC • June 22–25, 2025 ASEE
Paper ID #45615

Analyzing Student Information Literacy Skills: Perceptions, Outcomes, and Future Planning

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Abstract

In the Fall of 2023, a team of STEM Librarians initiated a year-long research project, funded by their library, to examine students' perceptions of their own information literacy skills and assess their actual competencies. The study focused on both undergraduate and graduate STEM students through an online survey designed to capture retrospective and targeted questions regarding key areas such as information retrieval, evaluating sources, thinking critically, and citing accurately. The survey contained forty-three questions and was structured into eight sections: demographics, general information literacy perception, information sources, information seeking/retrieval, evaluating sources, critical thinking, citation management, and copyright/plagiarism. A total of 132 completed responses were collected via Qualtrics. Findings revealed notable gaps in information literacy knowledge amongst undergraduate and graduate STEM students, particularly among international students. Based on these insights, the librarian team engaged with the School of Engineering to explore targeted instructional strategies for the international graduate student population. Periodic information literacy skill education is happening at the undergraduate level with one-shot instruction, but there is no systematic outreach to the STEM graduate student population.

Introduction

This project emerged from a desire among STEM librarians to take a more proactive role in shaping their information literacy instruction program. This STEM librarian team serves as liaisons to the School of Engineering and to the math and science departments in the College of Letters, Arts, and Sciences. As of Fall 2023, the School of Engineering had roughly 2,925 undergraduate students and 6,689 graduate students. The College of Letters, Arts, and Sciences had roughly 7,747 undergraduate students; however, this does include non-STEM majors within the college. Traditionally, the librarian team relied on a one-shot instructional model, but the constraints of limited classroom time and staffing challenges led the librarians to explore alternative methods of instruction. Traditionally, this team coordinated with disciplinary faculty on a variety of learning objectives such as information literacy, critical thinking, research skills, and library orientation, for example. However, covering such an array of topics in a limited timeframe resulted in a perceived lack of instructional autonomy, a challenge also noted in the research [1]. With instruction as a primary responsibility, teaching has become a critical aspect of librarian identity. This librarian-educator identity reflects efforts to forge sustainable and impactful relationships with disciplinary faculty in addition to seeking out mentorship and professional development opportunities to further enhance one's teaching skills [2].

There are numerous critiques of the one-shot model in the information literacy instruction scholarship that informed this team [3] [4] [5]. However, the one-shot model did have a positive influence on the librarian team as a means to introduce instruction and create defined learning

objectives. The one-shot model served as a way for the librarian team to meet disciplinary faculty and receive invitations into the classroom. Over several years of employing this method, the team began to recognize its limitations and ultimately fostered the confidence to explore and implement more comprehensive teaching strategies.

Over the past two years, the librarian team expanded its instructional support by developing asynchronous learning materials and tiered workshops outside the classroom. The asynchronous learning materials proved effective in meeting the demand for information literacy instruction. However, the tiered workshops series struggled with low attendance and engagement, leading to their discontinuation after several semesters. This experimentation provided valuable insights that helped the librarian team identify strengths and weaknesses of different learning modes and provided opportunities to create a community of practice within the team. Furthermore, it highlighted the importance of understanding student approach and perception of information literacy.

Research on student perceptions of information literacy provides critical insights into how students evaluate, utilize, and apply information. Various studies suggest that while students often overestimate their information literacy skills, many lack confidence in applying these skills to complex, real-world problems [6] [7]. This disconnect is further amplified among STEM students due to the rapid pace of information that is generated among these disciplines and the plethora of resources available to obtain the information [8]. Another contributing factor is that students use their information literacy skills to focus on achieving good grades rather than lifelong learning [9]. Therefore, it is no surprise that lifelong learning is one of the lowest ranked skills demonstrated by engineering graduates, despite an increased emphasis on lifelong learning [10].

In response to the complexities and evolving nature of information literacy in STEM disciplines, the librarian team identified a critical need to pivot beyond traditional instructional methods. To ground their efforts in data, the librarian team sought to initiate a survey and observation component of undergraduate and graduate STEM students' critical thinking skills, information evaluation behaviors, and their perceptions of these skills and behaviors. The librarian team aimed to identify themes in student perception and behaviors and use them to facilitate collaborative discussions with disciplinary faculty to advance information literacy outcomes.

At the time of this study, the librarians were actively engaged in the undergraduate writing courses but had minimal interaction between the librarians and STEM graduate students. To further complicate matters, the librarian team was not involved in specific courses nor knew of opportunities to enhance engagement among the STEM students. To address this gap, the librarian team secured an internal library research grant, to conduct an online survey and observe

students' skills in practice. The original plan was to spend the Fall 2023 semester conducting an online survey to assess student perceptions of their information literacy skills, and the Spring 2024 observing students' information literacy skills in practice. However, the IRB (Institutional Review Board) approval process required substantial procedural planning that the team did not initially anticipate which resulted in time constraints. Due to timeframe constraints, the observation component of the study was omitted. To compensate for omitting the observational component, the librarian team strategically revised the online survey, expanding the survey to assess not only student perceptions of information literacy but also gauge their information literacy skillset. This adjustment allowed the librarian team to retain the study's investigative scope despite the removal of the observational component.

The following section provides an overview of the methodology and results of the information literacy perceptions and skills survey. The goal of the survey was to support the librarian team in their decision-making and instructional planning. Particularly, in moving beyond the one-shot instruction model, with the aim of integrating instruction into the curriculum, co-teaching credit-bearing courses, or hosting workshops supported by departments, among other initiatives. Regardless of the survey results, the librarians remained committed to exploring new instructional designs and methods, hoping that the findings would enhance their practice and serve as a basis for discussions with disciplinary faculty. They encourage others to take proactive steps to refine their instructional practices and strengthen relationships with faculty. Although conducting a student survey can be time-consuming and requires detailed planning, it can provide valuable data to support informed conversations about information literacy instruction within and beyond the library.

Methodology

A survey, "Information Literacy Perceptions of Science and Engineering Students Survey", was advertised via printed library flyers, Instagram posts, and recruitment emails sent to specific STEM departments during the Spring 2024 semester. This survey was conducted through the Qualtrics platform and contained forty-three questions that were designed to collect demographic, student perception of their information literacy skills, and data on their actual information literacy abilities (see Appendix A). Topics such as information seeking/retrieval, evaluating sources, critical thinking, citation management, and academic integrity were measured in the perception and ability questions.

The librarian team received permission to incorporate information literacy ability questions from another organization's information literacy survey but did not obtain approval to share the specific questions for this publication. Despite not sharing the specific questions asked, the team can share the general themes for these questions and concept areas asked for each ability measuring question (see Appendix A). For example, the information literacy perception questions, the librarians aimed to gather data on the methods students use to find information

(through the library website, Google Scholar, AI, or databases, for example) and assess their confidence in their research and evaluation skills. Students were asked to evaluate their confidence in evaluating the credibility and reliability of sources, their experience using citation management software, and their knowledge of citation recognition. These responses provided foundational insight into students' information literacy skillset and their perception of these competencies.

For questions related to information sources and information seeking, the librarians aimed to understand students' research practices, including how they identify keywords, and navigate their searches. Similarly, for evaluation and critical thinking questions, the librarians explored student understanding of credible information and appropriate sources for research. In areas of citation management, copyright, and plagiarism questions, the librarians examined students' understanding of citations and their role in research, including paraphrasing, attribution, and image usage. Overall, these questions were designed to establish a foundation for understanding how students approach research, where they seek information, and how they solve problems.

The librarians also collected demographic information that included student academic level, international student status, major, and ethnicity. Academic level and major provided insight into student's program affiliation and whether they were undergraduate or graduate students. The inclusion of international student status and ethnicity aimed to deepen understanding of the cultural and ethnic backgrounds of students. Given this university has many STEM affinity groups, the librarian team recognized these organizations as potential partners for information literacy outreach instruction. Similarly, this university has a large international student population, and the librarian team considered targeted outreach initiatives with the potential of refining and reinstating the International Student Lunch & Learns from years prior.

To publish and circulate this online survey, the librarian team had to complete IRB approval through the university's Human Research Protection Program (Study ID UP-23-01182). To have the survey ready for distribution in the Spring 2024 semester, the IRB application process began in the Fall 2023 semester. This process required comprehensive documentation, including the project title, abstract, study personnel and their roles, funding source, a social and behavioral study protocol form, list of survey questions, examples of outreach flyers and social media posts, and certification of completion for a required social behavioral human subjects online training course. As mentioned previously, due to the rigor and comprehensive documentation of this application, our original proposal of conducting both a survey and an observation component was revised to only include the survey. Therefore, all survey responses maintained anonymity.

Students were recruited based on the following eligibility criteria: they were required to be at least 18 years old, enrolled as either an undergraduate or graduate student at that university,

and belong to a STEM department. STEM department was defined as any major/primary subject area within the School of Engineering or one of the eleven subject areas in the College of Letters, Arts, and Sciences (astronomy, biological sciences, chemistry, environmental studies, geological sciences, human biology, mathematics, neuroscience, ocean sciences, physics, or quantitative biology). A total of 132 students from our target populations completed the survey.

The librarian team was originally awarded $3,000 to incentivize both the online survey and observation component. However, since the observation was removed from the study, the team only used $1,000 of the funds, purchasing forty $25 Amazon gift cards. The recruitment messaging included information about the gift card raffle, which occurred after the survey had closed. A total of forty students received the gift cards following a live raffle over Zoom. The survey was open for four weeks, from mid-January to mid-February 2023.

Results & Findings

Significant attitudes towards students' self-perceived information literacy skills and their comparative performance were revealed.

Demographic Data

132 participants completed the survey (14 freshmen, 31 sophomore, 30 junior, 10 senior, and 47 graduate level students). 64.3% (n=85) of survey respondents were undergraduate students, with 9.4% (n=8) of the total undergraduate population responding as international undergraduate students. Of the 35.6% (n=47) of graduate student participants, 87.2% (n=41) were international students. All survey respondents were either students pursuing majors in the physical sciences of the College of Letters, Arts, and Sciences or the School of Engineering. Students who were under the age of 18, were not current students, or were students of other schools or programs at the school were automatically disqualified from completing the survey. The top four majors represented by students were: computer science, human biology, data science, and environmental sciences. The largest group of participants (90.2%) were aged between 18-24, with the remaining 9.8% falling between the ages of 25-44. Most participants were Asian (64.4%), followed by Caucasian (13.6%) and Hispanic/Latino (10.6%).

Perceptions

Perception questions were assessed using a five-level Likert scale: strongly disagree, somewhat disagree, neither agree nor disagree, somewhat agree, and strongly agree. The average agreement percentage in our assessment portion of the survey for domestic undergraduate student participants is 70.0% (Table 1A) while the average agreement percentage (average percentage of international undergraduate students who agreed of their self-perceived information literacy skills) for international undergraduate student participants is 75.9% (Table 1B). For domestic graduate students, the average agreement percentage was 66.7% (Table 2A),

while the average agreement percentage for international graduate students was 69.0% (Table 2B).

Table 1A. Domestic Undergraduate Student Perception			
Information Literacy Topic	Percent of Strongly Agree and Somewhat Agree by Question	Average Percentage by Topic	Total Percentage Average
Information Sources Q 6, 14	90.9	82.5	70.0
	74.0		
Information Seeking/Retrieval Q 4, 8, 10, 11, 15	84.4	74.8	
	76.6		
	62.3		
	63.6		
	87.0		
Evaluating Sources Q 2, 7	88.3	52.6	
	16.9		
Critical Thinking Q 3, 13	90.9	79.2	
	67.5		
Citation Management Q 5, 16	41.6	63.7	
	85.7		
Copyright and Plagiarism Q 9	50.6	50.6	

Table 1A. Percentage of Domestic Undergraduate Student Perception of Strongly Agree and Somewhat Agree by Information Literacy Topic

Table 1B. International Undergraduate Student Perception			
Information Literacy Topic	Percent of Strongly Agree and Somewhat Agree by Question	Average Percentage by Topic	Total Percentage Average
Information Sources Q 6, 14	87.5	81.3	75.9
	75.0		
Information Seeking/Retrieval Q 4, 8, 10, 11, 15	100.0	82.5	
	75.0		
	75.0		
	62.5		
	100.0		
	87.5	68.8	

Evaluating Sources Q 2, 7	50.0		
Critical Thinking Q 3, 13	100.0	81.3	
	62.5		
Citation Management Q 5, 16	50.0	75.0	
	100.0		
Copyright and Plagiarism Q 9	37.5	37.5	

Table 1B. Percentage of International Undergraduate Student Perception of Strongly Agree and Somewhat Agree by Information Literacy Topic

Table 2A. Domestic Graduate Student Perception			
Information Literacy Topic	Percent of Strongly Agree and Somewhat Agree by Question	Average Percentage by Topic	Total Percentage Average
Information Sources Q 6, 14	100.0	83.4	66.7
	66.7		
Information Seeking/Retrieval Q 4, 8, 10, 11, 15	100.0	70.0	
	33.3		
	50.0		
	66.7		
	100.0		
Evaluating Sources Q 2, 7	100.0	58.4	
	16.7		
Critical Thinking Q 3, 13	83.3	83.3	
	83.3		
Citation Management Q 5, 16	33.3	50.0	
	66.7		
Copyright and Plagiarism Q 9	33.3	33.3	

Table 2A. Percentage of Domestic Graduate Student Perception of Strongly Agree and Somewhat Agree by Information Literacy Topic

Table 2B. International Graduate Student Perception			
Information Literacy Topic	Percent of Strongly Agree and Somewhat Agree by Question	Average Percentage by Topic	Total Percentage Average
Information Sources Q 6, 14	75.6	74.4	69.0
	73.2		
Information Seeking/Retrieval Q 4, 8, 10, 11, 15	80.5	71.2	
	58.5		
	61.0		
	85.4		
	70.7		
Evaluating Sources Q 2, 7	85.4	56.1	
	26.8		
Critical Thinking Q 3, 13	82.9	76.8	
	70.7		
Citation Management Q 5, 16	53.7	64.7	
	75.6		
Copyright and Plagiarism Q 9	65.9	65.9	

Table 2B. Percentage of International Graduate Student Perception of Strongly Agree and Somewhat Agree by Information Literacy Topic

Regarding domestic undergraduate student perceptions, on average, the top two areas students reported the most confidence in were their knowledge of Information Sources (82.5%) and Critical Thinking (79.2%) (Table 1A). On average, the top two areas domestic undergraduate students reported the least confidence in were Evaluating Sources (52.6%) and Copyright and Plagiarism (50.6%) (Table 1A). For international undergraduate students, on average, the top two areas students reported the most confidence in were their knowledge of Information Seeking/Retrieval (82.5%), Information Sources (81.3%), and Critical Thinking (81.3%) (Table 1B). On average, international undergraduate students reported a lack of confidence in Evaluating Sources (68.8%) and Copyright and Plagiarism (37.5%) (Table 1B).

Regarding domestic graduate student perceptions, on average, the top two areas students reported the most confidence in were their knowledge of Information Sources (83.4%) and Critical Thinking (83.3%) (Table 2A). On average, the top areas domestic graduate students reported the least confidence in were Citation Management (50.0%) and Copyright and Plagiarism (33.3%) (Table 2A). For international graduate students, on average, the top two areas students reported the most confidence in were their knowledge of Critical Thinking

(76.8%) and Information Sources (74.4%) (Table 2B). On average, international graduate students reported a lack of confidence in Citation Management (64.65%) and Evaluating Sources (56.1%) (Table 2B).

Assessment

For the assessment portion of our study, survey participants were assessed using a multiple-choice exam, with one correct answer. From there, after calculating correct scores by question, we averaged the scores by topic. Averaging the scores by topic revealed which areas thematically students either performed well in or could benefit from additional instruction. We then calculated the total average correct score to gauge overall performance. The average correct score in our assessment portion of the survey for domestic undergraduate student participants is 72.5% (Table 3A) while the average correct score for international undergraduate student participants is 70.8% (Table 3B). For domestic graduate students, the average correct score was 76.7% (Table 4A), while the average correct score for international graduate students was 50.9% (Table 4B).

Table 3A. Domestic Undergraduate Student Performance

Information Literacy Topic	Percent Correct by Question	Average Correct Score by Topic	Total Average Correct Score
Information Sources Q 17-18	75.3	84.4	72.5
	93.5		
Information Seeking/Retrieval Q 20-22	63.6	64.0	
	63.6		
	64.9		
Evaluating Sources Q 23-25	68.8	67.1	
	61.0		
	71.4		
Critical Thinking Q 26, 27, 29	90.9	84.0	
	77.9		
	83.1		
Citation Management Q 30-31	90.9	83.1	
	75.3		
Copyright and Plagiarism Q 32-33	35.1	53.3	
	71.4		

Table 3A. Domestic Undergraduate Student Percentage of Correct Answers by Topic

Table 3B. International Undergraduate Student Performance			
Information Literacy Topic	Percent Correct by Question	Average Correct Score by Topic	Total Average Correct Score
Information Sources Q 17-18	75.0	81.3	70.8
	87.5		
Information Seeking/Retrieval Q 20-22	87.5	70.8	
	62.5		
	62.5		
Evaluating Sources Q 23-25	50.0	62.5	
	75.0		
	62.5		
Critical Thinking Q 26, 27, 29	75.0	79.2	
	75.0		
	87.5		
Citation Management Q 30-31	87.5	81.3	
	75.0		
Copyright and Plagiarism Q 32-33	25.0	75.0	
	75.0		

Table 3B. International Undergraduate Student Percentage of Correct Answers by Topic

Table 4A. Domestic Graduate Student Performance			
Information Literacy Topic	Percent Correct by Question	Average Correct Score by Topic	Total Average Correct Score
Information Sources Q 17-18	83.3	91.7	76.7
	100.0		
Information Seeking/Retrieval Q 20-22	66.7	83.3	
	83.3		
	100.0		
Evaluating Sources Q 23-25	66.7	66.7	
	66.7		
	66.7		
Critical Thinking Q 26, 27, 29	100.0	66.7	
	33.3		
	66.7		
	100.0	91.7	

Citation Management Q 30-31	83.3		
Copyright and Plagiarism Q 32, 33	33.3	66.7	
	100.0		

Table 4A. Domestic Graduate Student Percentage of Correct Answers by Topic

Table 4B. International Graduate Student Performance			
Information Literacy Topic	Percent Correct by Question	Average Correct Score by Topic	Total Average Correct Score
Information Sources Q 17-18	70.7	75.6	50.9
	80.5		
Information Seeking/Retrieval Q 20-22	41.5	48.8	
	48.8		
	56.1		
Evaluating Sources Q 23-25	43.9	35.0	
	22.0		
	39.0		
Critical Thinking Q 26, 27, 29	70.7	51.2	
	34.1		
	48.8		
Citation Management Q 30-31	78.0	61.0	
	43.9		
Copyright and Plagiarism Q 32, 33	24.4	42.7	
	61.0		

Table 4B. International Graduate Student Percentage of Correct Answers by Topic

On average by information literacy topic, domestic undergraduate students scored the highest on the information literacy topics Information Sources (84.4%) and Critical Thinking (84%), and the lowest on Information Seeking/Retrieval (64%) and Copyright and Plagiarism (53.3%) (Table 3A).

On average by information literacy topic, international undergraduate students scored the highest on the information literacy topics Information Sources (81.3%) and Citation Management (81.3%) and the lowest on Evaluating Sources (62.5%) and Copyright and Plagiarism (50%) (Table 3B).

On average by information literacy topic, domestic graduate students scored the highest on the information literacy topics Information Sources (91.7%) and Citation Management (91.7%) and the lowest on Evaluating Sources (66.7%), Critical Thinking (66.7%), and Copyright and Plagiarism (66.7%) (Table 4A).

On average by information literacy topic, international graduate students scored the highest on the information literacy topics Information Sources (76%) and Citation Management (61%) and the lowest on Copyright and Plagiarism (42.7%) and Evaluating Sources (35%) (Table 4B).

Discussion

The survey results indicate specific areas of student confidence and student proficiency in information literacy topics taught by academic librarians. The responses also highlight the similarities and differences in student perceptions of their skill and their actual performance.

The assessment results suggest proficiency varies significantly by topic. The higher scores in topics like Information Sources suggest high proficiency, likely reflecting more extensive exposure and instruction in these areas. In contrast, assessment scores displayed a notable lack of knowledge for students on engaging with topics like copyright, plagiarism, and advanced evaluation of sources. These results align with existing research that suggests that copyright, plagiarism, paraphrasing, and proper citations create challenges for students [11] [12] [13] [14]. In a study conducted by Dryden, 82% of students believe the responsibility to educate users about copyright is the librarian's duty [15]. Interestingly, research also highlights that many librarians may lack comprehensive knowledge of copyright, which could limit their ability to effectively teach this subject [16] [17]. This is particularly true for the librarian team, as the lack of any formal training within their institutions and the limited copyright instruction provided in library school contributes to this limitation.

However, this presents an opportunity for the librarian team to expand their expertise and take a leadership role in addressing these gaps and better support students in developing a well-rounded understanding of copyright and plagiarism. Many librarians have already laid the foundation for incorporating this type of instruction on campus. For example, authors Smith and Ellis empower librarians to become copyright coaches through case studies, storytelling techniques, lesson plans, and coaching scenarios tied to the ACRL Framework. They provide tools to clarify copyright situations, engage users, and apply principles to real-world contexts [18]. In addition, Darr provides practical strategies for librarians to teach students how to use information ethically and avoid plagiarism. Drawing from real-life examples, digital resource challenges, and tested instructional materials, she emphasizes understanding authorship, publication, and research integrity through engaging lessons and exercises [19].

Interestingly, domestic students at both the undergraduate and graduate level reported lower confidence levels and performed on average 6.3% higher than their agreement percentage. International students at both the undergraduate and graduate level reported higher confidence levels and performed on average 11.6% lower than their agreement percentage, suggesting a gap between self-perceived and actual abilities. This project itself was not initially designed to measure international students' performance separately; however, the results underscore a need for innovative approaches in designing information literacy instruction and library outreach, particularly for STEM international students. Compared to their domestic peers, international graduate students scored on average nearly 16.8% lower. While the sample size is comparatively small considering the overall student populations, the results support the need for more comprehensive information literacy instruction beyond the traditional one-shot sessions, to better support the scholarly and research needs of students, especially international students.

Limitations

The study described above was conducted by individuals with primary ties to the field of librarianship and library services, rather than a background or degree in research methodology or STEM education; therefore, certain limitations and biases may exist within the data and interpretations from the data. The survey design may benefit from requiring participants to answer all questions to account for consistency in answers (e.g. students identifying as graduate then marking themselves as a junior class student). Due to the length of the survey measuring both perceptions and information literacy skills, participants may have experienced survey fatigue, which resulted in half-completed responses excluded from the calculations. The survey was designed to demonstrate and highlight the differences between student perceptions of their information literacy and critical thinking skills and their assessed performance. However, there would be additional benefits in examining the relationship between confidence levels and test performance, as there may not be a 1:1 correlation, as used in this study or studying the differences between undergraduate and graduate student information literacy preparedness in all subjects. Future iterations may also explore gender identity in information literacy performance. The survey distribution method may have also impacted participant responses based on library patronage. Non-STEM students who came to study at the Science and Engineering Library could see the survey flyers promising an opportunity to participate in the raffle for a gift card. As our survey and recruited participants were limited to our institution and targeted populations, it should be noted that our findings may not be applicable or generalizable to other institutions.

An area for future consideration would be to include more survey questions related to students’ understanding and use of artificial intelligence (AI). While the survey did have one question related to their use of ChatGPT specifically, any future studies of students’ information literacy skills should include the use of AI in information retrieval and citation. This would highlight a gap in understanding how students engage with AI and the ethical and practical challenges they might face; particularly, ethical concerns, such as the risks of plagiarism,

misinformation, over-reliance, and the impact of their critical thinking skills.

Conclusion

This study provides insights into the information literacy skills and perceptions of STEM students, revealing key strengths and persistent gaps that focus on implementing tailored strategies for information literacy instruction. The survey revealed that students felt confident in areas such as knowledge of information sources and critical thinking. However, notable gaps exist in topics like copyright, plagiarism, and advanced evaluation of sources, reflecting a potential lack of exposure to or understanding of ethical research practices. Graduate students, a majority of whom were international students, faced pronounced challenges in information seeking and retrieval, highlighting the complexity of advanced research processes and the unique difficulties faced by this demographic.

Our findings emphasize the necessity for differentiated instructional strategies that address the specific needs of STEM students at various academic levels. Tailored instruction, gamified activities, outreach events, or thematic programming focusing on ethical research, academic integrity, and advanced information retrieval techniques could bridge identified gaps. The significant challenges observed among international graduate students suggest an opportunity for enhanced outreach and support tailored to this demographic.

Based on these results and conclusions, the librarian team convened with a small group of faculty from the School of Engineering to discuss broader integration of information literacy within their undergraduate and graduate curriculum. As mentioned previously, the undergraduate curriculum presents more opportunities for incorporating information literacy instruction. Currently, a new course in the undergraduate curriculum was launched with one member of this librarian team and an engineering faculty member, Information Literacy: Navigating Digital Misinformation, for the Spring 2025 semester. This general education course explores information literacy frameworks in the context of ethical design and social media. Although replicating this work into the graduate curriculum proves to be more challenging, the librarian team has recently partnered with the School of Engineering Graduate Academic Services and Programs department to host a series of workshops geared towards library orientation and information literacy concepts. These sessions have been tailored to meet the specific needs of graduate students, with an emphasis on copyright and plagiarism, and effective utilization of library resources.

These initiatives demonstrate how the survey data has guided the librarian team in exploring new methods for instruction and opened new avenues for collaboration with academic partners. Moving beyond the one-shot information literacy instruction model requires ongoing collaboration between the librarians and the academic departments to ensure these concepts are

integrated throughout the curriculum. Since conducting the survey, the librarian team feels better equipped to engage in these conversations and are eager to explore new partnerships.

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APPENDIX A

Information Literacy Perception of Science and Engineering Students Survey

Introduction

Our names are Alvaro Quezada, Cari Kaurloto, Jane Lah, and we are faculty members at the University of Southern California. We are conducting a research study to obtain insight into the perceptions held by science and engineering undergraduate and graduate students at the University of Southern California regarding their ability to find, understand, evaluate, and use information effectively. The name of this research study is "Information Literacy Perception of Science and Engineering Students." We are seeking your participation in this study.

Your participation is completely voluntary, and we will address your questions or concerns at any point before or during the study.

You may be eligible to participate in this study if you meet the following criteria:

1. You are a USC undergraduate or graduate student.

2. You belong to USC Viterbi School of Engineering or USC Dornsife College of Letters, Arts, and Sciences and whose majors are one of the following: astronomy, biological sciences, chemistry, environmental studies, geological sciences, human biology, mathematics, neuroscience, ocean sciences, physics, or quantitative biology.

3. You are over 18 years old.

If you decide to participate in this study, you will be asked to do the following activities:

1. Complete an online survey for 20 minutes.

We will publish the results in a presentation and or publication. Participants will not be identified in the results. We will take reasonable measures to protect the security of all your personal information. All data will be de-identified prior to any publication or presentations. We may share your data, de-identified with other researchers in the future.

If you have any questions about this study, please contact Alvaro Quezada: aquezada@usc.edu or (213) 740-4442. If you have any questions about your rights as a research participant, please contact the University of Southern California Institutional Review Board at (323) 442-0114 or email hrpp@usc.edu.

Do you agree to complete the survey?

- No
- Yes

Criteria Questions

I am at least 18 years old.

- Yes
- No

What is your current USC student stats?

- Undergraduate
- Graduate
- I am not a USC student

I am a student who belongs to USC Viterbi School of Engineering OR USC Dornsife College of Letters, Arts, and Sciences AND my major is one of the following: astronomy, biological sciences, chemistry, environmental studies, geological sciences, human biology, mathematics, neuroscience, ocean sciences, physics, or quantitative biology.

- Yes
- No, my major is not in either of these schools or programs.

Demographic Information

What is your academic level?

- Freshman
- Sophomore
- Junior
- Senior
- Graduate – Masters or Doctoral

Are you an international student?

- No
- Yes

What is your major?

- Astronomy
- Biological Sciences
- Chemistry
- Environmental Sciences
- Geological Sciences
- Human Biology
- Mathematics
- Neuroscience
- Ocean Sciences
- Physics

- Quantitative Biology
- Aerospace and Mechanical Engineering
- Astronautical Engineering
- Biomedical Engineering
- Chemical Engineering
- Civil Engineering
- Computer Science
- Data Science
- Electrical and Computer Engineering
- Environmental Engineering
- Industrial and Systems Engineering
- Information Technology Program
- Material Science
- Petroleum Engineering
- Systems Architecture and Engineering
- Other:

What is your age group?

- 18-24
- 25-34
- 45-54
- 55-64
- 65 and above

Please select the term that best describes you.

- White/ Caucasian
- Black/ African American
- Hispanic/ Latino
- Asian/ Pacific Islander
- Native American/ Alaska Native
- Mixed/ Biracial
- Other:

Perception Questions

1. How often do you use the following for your research?

	Always	Often	Sometimes	Rarely	Never
USC Libraries website					
Google Scholar					
Generative AI					
Databases					

2. I am comfortable evaluating a piece of information to determine its value for my research projects.
    - Strongly disagree
    - Somewhat disagree
    - Neither agree nor disagree
    - Somewhat agree
    - Strongly agree

3. I am confident with my ability to evaluate the credibility and reliability of information sources.
    - Strongly disagree
    - Somewhat disagree
    - Neither agree nor disagree
    - Somewhat agree
    - Strongly agree

4. I am comfortable using search strategies to develop keywords for my research projects.
    - Strongly disagree
    - Somewhat disagree
    - Neither agree nor disagree
    - Somewhat agree
    - Strongly agree

5. I am comfortable using citation management software when conducting research. (e.g. EndNote, Mendeley, RefWorks)
    - Strongly disagree
    - Somewhat disagree
    - Neither agree nor disagree
    - Somewhat agree

- Strongly agree

6. I am confident in my ability to distinguish between types of information sources. (e.g. book, journal article, newspaper article, blog)
    - Strongly disagree
    - Somewhat disagree
    - Neither agree nor disagree
    - Somewhat agree
    - Strongly agree

7. I am comfortable using criteria tools (e.g. CRAAP, SCAN, SIFT, etc.) used to evaluate the credibility and reliability of sources when conducting research.
    - Strongly disagree
    - Somewhat disagree
    - Neither agree nor disagree
    - Somewhat agree
    - Strongly agree

8. I am confident in being able to find and use databases.
    - Strongly disagree
    - Somewhat disagree
    - Neither agree nor disagree
    - Somewhat agree
    - Strongly agree

9. I am confident in my ability to follow copyright laws regarding the use of information for my research projects.
    - Strongly disagree
    - Somewhat disagree
    - Neither agree nor disagree
    - Somewhat agree
    - Strongly agree

10. I am confident in being able to find and use a subject-specific database in the USC Libraries website.
    - Strongly disagree
    - Somewhat disagree
    - Neither agree nor disagree
    - Somewhat agree
    - Strongly agree

11. I know how to use Boolean operators in my keyword searches. (e.g AND, OR, NOT)
    - Strongly disagree

- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Strongly agree

12. Which citation managers do you use? (select all that apply)
    - Refworks
    - Mendeley
    - EndNote
    - Zotero
    - Other

13. I often fact-check the information I encounter online before accepting it as true.
    - Strongly disagree
    - Somewhat disagree
    - Neither agree nor disagree
    - Somewhat agree
    - Strongly agree

14. I am confident in my ability to recognize different types of information from a citation. (e.g. book, journal article, newspaper article, blog)
    - Strongly disagree
    - Somewhat disagree
    - Neither agree nor disagree
    - Somewhat agree
    - Strongly agree

15. I am comfortable adjusting my search strategies if I encounter limited or inadequate search results.
    - Strongly disagree
    - Somewhat disagree
    - Neither agree nor disagree
    - Somewhat agree
    - Strongly agree

16. I am confident in my ability to cite my sources.
    - Strongly disagree
    - Somewhat disagree
    - Neither agree nor disagree
    - Somewhat agree
    - Strongly agree

Measuring Ability Questions

Information Sources

17. Participants were asked to differentiate between accurate and misleading information.

18. Participants were asked to discern primary, secondary, and tertiary sources.

Information Seeking/Retrieval

19. Participants were asked to describe how they typically begin the research process for a research project.

20. Participants were asked to choose keywords for a search query.

21. Participants were asked to determine the best search strategy.

22. Participants were asked about Boolean operators.

Evaluating Sources

23. Participants were asked to identify appropriate research sources.

24. Participants were asked to determine an author's tone and bias.

25. Participants were asked to discern different types of sources.

Critical Thinking

26. Participants were asked to critically assess the credibility of information.

27. Participants were asked about their ability to paraphrase.

28. Participants were asked about their criteria to filter misinformation in their research.

29. Participants were asked about their research strategy when evaluating for scholarly sources

Citation Management

30. Participants were asked about their knowledge of citation styles.

31. Participants were asked to evaluate a citation to determine the type of resource.

Copyright and Plagiarism

32. Participants were asked to properly cite an author when paraphrasing.

33. Participants were asked about their copyright constraints with information usage.

34. Would you like to participate in the raffle?
    a. Yes
    b. No