Student Perspectives on Using Generative Artificial Intelligence for Research: A Qualitative Approach

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abstract: This study examined undergraduate students' use of generative artificial intelligence (GAI) for research assignments and its intersection with traditional library databases. Semi-structured interviews with 16 students revealed GAI is primarily used for grammar, summarizing, brainstorming, and locating sources. While students value GAI for efficiency, they express concerns about accuracy and plagiarism, highlighting a need for guidance on prompt crafting and source evaluation. Participants reported difficulty locating scholarly articles with GAI, preferring library databases for this task. The study suggests librarians can play a crucial role in providing GAI literacy instruction, including teaching effective prompt engineering for database searching, thereby supporting student research strategies.

Introduction

November 30, 2022, was a momentous day that would change how people search for information with the launch of ChatGPT. Other companies soon followed with AI programs, such as Microsoft's Co-Pilot and Google's Bard (now named Gemini). These new AI programs represent a seismic shift from previous AI technologies. They are known as generative artificial intelligence (GAI) and differ from early AI programs based on machine learning that made predictions using data. GAI programs actually create new content, and they have been trained on billions of pieces of data that are publicly available on the internet.[1] What this means to users is the newfound availability of user-friendly GAI programs that provide answers that appear to have been created by humans.[2] The convenience and simplicity of GAI has led to a wide scale adoption of these programs, affecting every industry including higher education.

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Generative AI significantly impacts libraries, affecting librarians, faculty, and students. Librarians are concerned about the accuracy of GAI-generated answers and users potentially relying more on GAI for convenience, reducing their use of librarians and library databases. Researchers like Leo S. Lo, a leading scholar in the field of GAI, emphasize the importance of librarians developing new skills. He states, "It is crucial for professionals in this field to engage in continual reskilling to maintain relevance and efficacy in an increasingly AI-driven work environment."[3] Faculty must balance the need for students to become familiar with GAI for their careers with their concerns about plagiarism. A heavily cited article on college students and GAI is "Chatting and cheating: Ensuring academic integrity in the era of ChatGPT" by Cotton et al.[4] Students are increasingly using GAI for their research assignments and a recent study at Harvard revealed that 65 percent of students use GAI for their research papers.[5]

The study discussed here aims to understand how undergraduate students use GAI for research assignments, their perceptions of its ethical implications, and ways librarians can best support them. Specifically, the study explores how students use GAI alongside library resources, their views on responsible and ethical GAI use, and their interest in librarian guidance on integrating GAI into their research process.

Literature Review

The researchers examined peer-reviewed articles from library journals and education periodicals, focusing on popular generative artificial intelligence (GAI) programs like ChatGPT and Gemini, which are commonly used by students.

Academic Libraries and GAI

An expanding body of literature explores how librarians are defining their roles and assisting with generative artificial intelligence within their institutions. Some librarians find promoting GAI on campus challenging and believe it is beneficial to collaborate with organizations like IT departments and teaching centers.[6] At the University of Wisconsin-Eau Claire, librarians partnered with a professor and their teaching center to lead Zoom discussions about GAI. While librarians have often been early adopters of technology, with GAI, librarians do not have a choice in rapidly improving their skills because, "educators and students began the race to learn about this tool at the same time."[7] As GAI grows in importance, libraries should consider whether to provide site licenses for premium GAI tools.[8] At the University of South Florida, librarians collaborated with the AI institute and teaching center to create a LibGuide addressing issues such as copyright, publisher policies, citing AI sources, and assessing AI content reliability. This initiative's success relied heavily on strong relationships between librarians and faculty.[9]

Librarians can build on existing library competencies to integrate GAI with information literacy and assist students with prompt engineering. Prompts are questions or commands that users type into the dialog box of an AI platform to receive an answer. Dr. Lo, a library school dean and prompt engineering researcher, developed the CLEAR (Concise, Logical, Explicit, Adaptive, Reflective) framework to help users create more effective prompts.[10] Librarians can incorporate the CLEAR framework into their infor-

mation literacy sessions to help students use GAI more effectively. Benjamin Hall and Jennifer McKee present concrete examples of librarians using ChatGPT prompts to answer reference questions, highlighting the effective and ineffective uses of generative artificial intelligence.[11] Some librarians adopt a cautionary approach, noting that while prompt engineering and database query construction have similarities, there are important differences. While database queries, "Prompt clearly structured message[s] to databases with little surprises," prompts in GAI are much less predictable according to Borui Zhang.[12]

Librarians can leverage their traditional information skills to teach students the responsible use of GAI for research purposes. Amy James and Ellen Hampton Filgo integrated ChatGPT competencies into all six frames of ACRL's Framework for Information Literacy.[13] An example of librarians incorporating GAI into instruction is a case study in which students analyzed ChatGPT-generated essays based on peer-reviewed sources. The students were asked to verify the accuracy of citations and identify passages that should have citations but lacked them.[14]

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Much empirical research in the library field on generative AI focuses on assessing the accuracy of information from ChatGPT. This is relevant because librarians can help students evaluate this information's correctness, thereby encouraging the use of library databases. Katie Lai analyzed 58 email reference questions sent to their library, rating ChatGPT's responses on a scale of one to three for accuracy. The average quality of ChatGPT's answers was 2.07 out of 3. The modest performance was attributed to limited data for academic research and much scholarly research being behind paywalls.[15] Similarly, Sharon Q. Yang and Sarah Mason compared responses from librarians and ChatGPT to 30 reference questions, rating them with a rubric. While librarians generally scored higher, ChatGPT sometimes provided better answers. ChatGPT scored much lower on questions about accessing specific data and articles, aligning with Lai's findings.[16] Michael Deike found similar results when analyzing business reference questions using Perplexity and ChatGPT. Both AI platforms provided mixed results, the author noting that GAI relies on publicly available data and does not access subscription business databases.[17] Despite its limitations in answering research questions, Xiaotian Chen found that ChatGPT outperformed traditional library chatbots in identifying the best databases for locating law reviews.[18]

Moreover, a significant issue with GAI for research is fake citations, or "hallucinations." William H. Walters and Esther Isabelle Wilder found that 55 percent of citations from the free version of ChatGPT and 18 percent from the paid version were fabricated.[19] Bridges explained that librarians are skilled in helping students identify fake citations.[20] Literature on the accuracy and completeness of GAI aids librarians in assessing its strengths and limitations.

There is a lack of quantitative and qualitative studies on students' use of GAI in the library field. Librarians at Adeleke University in Nigeria surveyed undergraduates

in a library users' education course. Students cited ChatGPT's main advantages over librarians as time efficiency and a broader knowledge base, while its biggest drawback was its inability to read emotions.[21]

The study most similar to the current research is a Harvard-based study, in which researchers surveyed students about their use of GAI for academic work. While 65 percent of students used GAI, non-users cited concerns about plagiarism and potential harm to learning. Students primarily used GAI for summarizing research papers or editing their writing and were concerned about its accuracy, making them less likely to use GAI for locating specific sources. They expressed interest in using locally maintained GAI tools, viewing them as more trustworthy.[22] Building on the quantitative study by Amy Deschenes and Meg McMahon, which revealed high GAI adoption rates among both undergraduate and graduate students, the current qualitative study delves into the nuanced ways undergraduate students at a liberal arts institution integrate GAI into their research practices. This study specifically explores prompt engineering, the interaction between generative AI and traditional library databases, GAI's role in paraphrasing and brainstorming, as well as faculty guidance on the use of GAI. Moreover, while Deschenes and McMahon highlight locally maintained GAI platforms as a key implication, the current article emphasizes the role of librarians in assisting students with prompt engineering and integrating GAI with library databases.

Students' Attitudes Toward GAI

The most relevant literature for the current study comes from empirical articles in education journals. These studies highlight factors influencing GAI use among students, perceived benefits and concerns, disciplinary differences in confidence levels, and ethical considerations. Artur Strzelecki surveyed college students about their motivations for using ChatGPT, employing the Unified Theory of Acceptance and Use of Technology (UTAUT) framework. The study found that performance expectancy, habit, and hedonic motivation were significant predictors of ChatGPT use.[23]

A survey of students from six universities in Hong Kong, conducted by Cecilia Ka Yuk Chan and Wenjie Hu, found that most students were knowledgeable about GAI and had a favorable attitude toward it. However, they expressed concerns about becoming overly reliant on GAI. Students praised GAI for its immediacy in assistance and effective brainstorming.[24] A similar study at an Australian university found fewer students were aware of GAI compared to Chan and Hu's study. However, students who extensively used GAI rated themselves as very confident in their ability to use it. Additionally, STEM and business students were more confident in their GAI skills compared to those in humanities and medical fields.[25] A study at Liverpool University found that most students supported using GAI for grammar support but considered writing an entire paper with GAI unethical. Students with the lowest confidence in their writing skills were more supportive of using GAI to write papers.[26]

Students Versus Faculty: Acceptance of GAI

Some studies have explored differing opinions on the usefulness and ethics of generative AI between students and professors. These findings are relevant to librarians, who

must balance the needs of both groups. Cecilia Ka Yuk Chan and Katherine K.W. Lee found that Gen Z students and Millennial and Gen X professors agreed on the need for university policies on GAI use and recognized its importance for students' careers. However, students were more likely to use ChatGPT for saving time and improving writing skills, while professors were more concerned about GAI hindering learning and stressed the importance of fact-checking GAI-generated answers.[27] Alex Barrett and Austin Pack found that both students and professors agreed it was inappropriate to use GAI to write entire papers but considered brainstorming an acceptable use. They found differences in students' and professors' views on using GAI for outlining and revision, with students more inclined to find these uses acceptable.[28] Similarly, Faouzi Kamoun et al. noted that while only 46.8 percent of engineering and business students believed ChatGPT could increase plagiarism, 78.6 percent of faculty shared this concern. Overall, students held a more positive attitude toward ChatGPT compared to faculty.[29]

Methodology

This study aims to answer the following research questions:

1. **How** are undergraduate students utilizing generative AI tools to support their research projects?
2. **What** are undergraduate students' perspectives on the ethical implications of using generative AI in their coursework?
3. **In** what ways can librarians effectively help students navigate the use of generative AI?

To investigate the experiences and perspectives of undergraduate students who actively use generative AI in their academic research, the researchers conducted semi-structured interviews in Spring 2024 with 16 students who identified as moderate to heavy GAI users and who had completed at least one research assignment using the technology.

Participants were recruited via an email invitation (see Appendix A) distributed to all 3,629 undergraduates at the university. Of the 96 students who expressed interest, approximately half were excluded for not meeting the study criteria of being at least moderate users of GAI and having completed a research assignment. Sixteen students were then purposefully selected through a combination of convenience and quota sampling. To ensure timely participation before final examinations, when student availability tends to decrease, initial responses were prioritized. Subsequently, quota sampling was employed to prioritize a diversity of majors and years of study among participants. The researchers aimed to secure at least two participants from each major academic division, with a preference for a roughly equal number of interviewees across divisions.

Although the sample aimed for diversity, it did not perfectly mirror the university's overall undergraduate population. Most undergraduates at this institution are enrolled in business programs, followed by social sciences, communications, and natural sciences, with a smaller proportion in the humanities. The sampling strategy prioritized representation across different majors to gather diverse perspectives on GAI use, even if it meant deviating slightly from the exact proportions of the broader student body

(see Table 1). Consequently, business students were slightly underrepresented in the study, despite their high overall enrollment at the institution. While a small number of first-year students expressed initial interest, none participated in the final interviews. This was partly due to the prioritization of early respondents to ensure timely participation before final examinations and the need to balance representation across different majors and years of study within a small sample size. These limitations highlight the challenges of achieving perfect sample representation, even with targeted recruitment and a combined sampling approach.

Although the sample size of 16 interviewees may seem small, research by Greg Guest, Arwen Bunce, and Laura Johnson suggests that this number is sufficient to achieve data saturation. Their findings indicate that significant themes can be identified after only six interviews, with saturation typically reached after twelve.[30] The researchers interviewed more than twelve participants to ensure a sufficient diversity of majors. Participants received $50 Amazon gift cards as incentives.

Study interviews lasted between 30 to 45 minutes. Students were asked open-ended questions (see Appendix B), the first question being, "Describe a time that you used an AI program to work on a research paper." When appropriate, the researchers asked students probing questions to encourage the interviewees to expand on interesting lines of inquiry. The researchers asked follow-up questions, such how students used GAI for research purposes, whether the information they received was trustworthy, the ethics of using GAI, how the students combined GAI with library databases, and the guidance they received from professors.

All interviews were conducted via Zoom, recorded, and transcribed using the platform's transcription feature. The transcribed interviews were uploaded into NVivo, a program to analyze qualitative research.

A codebook was developed using 33 terms that represented key information from the interviews, including references to concepts such as "professor's guidance" and "prompt strategies." Most of the codes were predefined, focusing on areas such as ethics and the role of librarians, which aligned with the study's research questions. These were further enriched with codes for specific student uses of GAI, such as "quiz creation," "math," "summarizing" or "outlines," which surfaced during the interviews.

To identify themes, recurring patterns and relationships between codes were analyzed, with a focus on both hierarchical and conceptual connections. For instance, closed codes like "librarians prompt assistance" and "librarians checking sources'" were combined with the open code "librarians information literacy" to form the theme "Librarians' Roles with GAI." Similarly, the theme "How Students Use GAI for Academic Research" emerged from a combination of codes derived from specific interview questions, such as "GAI research project," "locating sources," "effective uses of GAI," and "frustrations with GAI," and open codes that surfaced during the interviews like "brainstorming," "grammar," "paraphrasing," and "outlines.".

The researchers reviewed the themes several times to make sure that they accurately reflected the data from the coded transcripts. This approach allowed for a comprehensive understanding of how undergraduate students perceive and utilize GAI in their research practices.

Table 1.

Study participants' majors and class standing

Major	Year in School
Business	Junior
History/Economics	Junior
Psychology	Senior
Psychology	Junior
Business	Junior
Sustainability Studies	Sophomore
Sports Administration	Junior
Business	Senior
Psychology	Junior
Journalism	Junior
Biology	Junior
Psychology	Junior
Political Science/Philosophy	Junior
Sports Medicine	Sophomore
Nutrition	Sophomore
Nutrition/mathematics	Senior

Limitations

This study had multiple limitations. The university in the study is a private liberal arts institution, and the findings may not be generalizable to larger universities that offer degrees in disciplines like engineering or nursing. Additionally, all participants were undergraduate students, so the results may not be applicable to graduate students. Furthermore, by focusing on students who used GAI for a research assignment and self-identified as at least moderate users of GAI, the findings may not represent the practices of less experienced users. Moreover, the inclusion criteria might have limited participation from students who were less confident in their knowledge of GAI. A disciplinary limitation of the study was that the authors were only able to interview two students majoring in liberal arts. The requirement that participants be familiar with GAI for research and have completed an assignment using it seemed to result in a higher representation of seniors and juniors.

The study had some methodological limitations. Interviewing students about their GAI usage may have led to idealized accounts, potentially differing from findings in a study that directly observed students using GAI for research. Additionally, due to resource constraints, only one author was responsible for coding the transcripts.

Results

The authors identified the following themes within the data: (1) How students conduct research (2) Ethics of using GAI (3) Faculty Perspectives and Guidance on GAI (4) Prompts (5) Confidence (6) GAI and library databases (7) Librarians' roles with GAI.

How Students use GAI for Academic Research

To gain insight into how students use GAI for research projects, librarians asked students to describe a class assignment where they incorporated generative GAI tools. Students reported various uses of generative AI, including summarizing scholarly works, brainstorming, grammar assistance, data analysis, and locating sources. Grammar correction was the most popular use of generative AI for assignments, with 14 students reporting this use. This was followed by summarizing books and articles, reported by 13 students, brainstorming by 12 students, locating sources by four students and data analysis by three students. Even though this use was not related to the research process, four students reported using GAI to help them prepare for tests by generating quiz questions from their notes. Students' satisfaction with generative AI assistance was moderate, with no users expressing complete satisfaction or dissatisfaction. A student expressed the overall sentiments of the participants by explaining, "It never got everything totally correct, but it did lead us in the right direction."

Students reported various uses of generative AI, including summarizing scholarly works, brainstorming, grammar assistance, data analysis, and locating sources.

When asked about the GAI programs they used, ChatGPT was used by all but one student in the study. Half of the respondents used Grammarly, two mentioned Co-Pilot, and one used Bard (now Gemini). Some students were unsure whether Grammarly was a GAI tool. Only two students reported using the paid version of ChatGPT, even though multiple students understood the limitations of the free version, such as searching outdated content on the Internet and the inability to upload PDFs or Excel files. A participant explained, "The AI tools I use are mostly free. That's why I'm using them."

Brainstorming and Organization

The authors asked students about the tasks that GAI excels at, and several students noted that GAI was useful for identifying possible topics and related themes. Help with brainstorming was viewed as a good use because students perceived GAI as effective at providing basic information, with one student comparing the GAI output to Wikipedia entries, and another using the analogy of basic concepts from a textbook. Similar to the

task of idea generation was creating outlines, and a student reported, "I think it's effective at making an outline or an organization of thoughts."

Grammar and Editing

Students who used generative AI for editing papers and checking grammar found the programs effective. However, two students expressed concerns that editing could potentially cross the line into plagiarism. Many students found generative AI helpful for summarizing lengthy scholarly articles and relied on it specifically to interpret the statistical data presented in the results sections, which they often found difficult to understand on their own. Students who used generative AI for editing papers and checking grammar found the programs effective. However, two students expressed concerns that editing could potentially cross the line into plagiarism.

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Limitation of Basic Information

Students were also asked about tasks that posed challenges for GAI. While students reported GAI as effective for providing basic overviews, they were less impressed with its ability to give detailed information. A student said, "It's usually more broad…when it's trying to be specific it …struggle with that." In addition to providing information at a basic level, students also thought that GAI struggled with theoretical concepts as a student noted when they discussed "… abstract concepts AI would struggle with." Two natural sciences students explained that beyond basic information, GAI provided information that was either incorrect or too vague for more advanced science problems. Similar to GAI limitations on detailed information, five students reported that simple math problems could be performed, but GAI struggled with more advanced math. A student explained, "If I send ChatGPT an abstract algebra problem… it will start to glitch."

Locating Sources

Many students reported attempting to use GAI to locate sources with varying levels of success. Eight students reported that they found GAI ineffective at locating articles, two reported moderate success, three never attempted to locate articles, and two found it effective. A student expressed their frustration with locating scholarly articles on ChatGPT, "It gave me things that didn't exist. It sent me hyperlinks that… took me nowhere." Five students used GAI as a lead to locate articles or books by suggesting types of sources or places to look, rather than obtaining specific citations, and reported this as an effective research strategy. For example, a student looking for historical primary sources used ChatGPT to identify possible types of primary sources rather than specific citations. They said, "It didn't cite anything, but it suggested…speeches that some president gave…letters that the Native Americans sent to each other." Furthermore, a

student who was unfamiliar with library databases used ChatGPT to identify databases for their research topics.

Trustworthiness and Credibility

Students were asked about the trustworthiness of the answers they received from generative AI. Overall, the students had a moderate level of trust in the credibility of GAI information. However, their level of confidence was contextual and many articulated that basic information was more credible than more advanced topics. An interviewee explained, "Anything that requires…any kind of source. You just can't use it for that." Seven students were concerned about the lack of citations and a typical response was, "It can't provide citations for any data." However, a student with a subscription version of ChatGPT reported some success with obtaining citations for information. When the authors asked students how they knew some of the answers they received from GAI might not be accurate, eight students replied that they instantly were skeptical of the information because of their prior subject knowledge. A respondent stated, "If you don't have previous knowledge … you're…going to be led astray." Moreover, ten students explained that they would consult other resources to determine whether the information from GAI was accurate. A representative response was, "You have to assume that it could be wrong. So you always have to just double check your work."

Ethics of Using GAI

Student Perceptions of Ethical Use

Ethical concerns are one of the most significant issues with GAI in academia which influences the extent to which students will use GAI for class projects. The authors asked students about their perspectives on the ethics of using GAI for class assignments. All 16 students articulated that using GAI to write either significant portions of papers or entire essays was unethical. They explained that using GAI to perform tasks like summarizing, correcting grammar, locating sources and brainstorming were acceptable uses. A student explained that rewording with GAI was an ethical use, "It'd be akin to… asking a friend how you should word it or… what they think of that current paragraph." Other interviewees explained that they were unsure about the proper level of use and a participant shared, "Not knowing the line of like acceptable [use], I guess plagiarism might be the word."

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Concerns about Unethical Use by Peers

When asked about their peers' use of GAI, 15 out of the 16 participants reported being aware of other students using GAI in ethically questionable ways. These included copying and pasting large sections of text into research papers, using GAI without permission on take-home quizzes, and completing math homework. However, the majority of re-

spondents were not overly concerned with this behavior and thought that students who cheated with GAI were not succeeding. For example, a student shared, "I don't think the ones that are using it heavily are getting great grades on their papers." Beyond the obvious disregard of academic integrity codes, the interviewees explained why misuse of GAI could harm students' education. Specifically, 12 students stated that overuse of GAI would harm the students' education. An interviewee stated, "We're not hurting our professor by lying to them. We're hurting ourselves." Moreover, four students thought that papers that were largely written by GAI would not be very well written papers. A student shared, "It would be an awful research paper…you wouldn't get a good grade."

GAI Detection Sites

The authors asked students about their knowledge of GAI detection sites like Turnitin. All 16 students were aware of these programs, but half the students reported they had little knowledge about how they worked. In addition, half of the students reported little faith in the accuracy of these programs. In fact, six students ran tests of papers on GAI detectors to determine the programs' accuracy. A student stated, "I submitted… a work entirely AI written…and then it didn't flag anything." It is worth noting that the university in the study uses Turnitn for GAI detection, but the students were relying on free detectors. A lack of confidence in GAI detectors makes students uneasy about acceptable use of GAI for their assignments. A student remarked, "I want more transparency in the AI checking tools… you get flagged when…you use it to brainstorm."

Faculty Perspectives and Guidance on GAI

Given the ethical complexities and varying student perceptions of GAI, faculty guidance plays a crucial role in shaping students' responsible and effective use of these tools. The researchers asked students about the guidance their professors provided about using GAI for research purposes and there was a wide range of policies among the professors. Students reported that all professors addressed GAI either in lecture or syllabi and made it clear to students that they could not write their entire papers with GAI. Ten students reported that most professors explain GAI in negative terms and primarily warn about academic integrity violations rather than explain the positive uses of GAI. A representative response was, "We'll put your paper through…Turnitin… if it…signifies that you use ChatGPT…you're…given a zero." Students desired more guidance from faculty on the acceptable uses of GAI and a student stated, "It would be awesome if a professor was like here are some ways you could use AI effectively."

Some students recounted professors giving specific recommendations on acceptable uses of GAI, and eight students discussed professors who explained its positive applications. These professors appeared to be exceptions, and a student told us, "All my professors have been really against it, and say no AI except Professor [X]." The professors who were supportive of GAI tended to list creating summaries and brainstorming as acceptable uses.

Four participants explained that in many cases, students were more knowledgeable about GAI than faculty. One student thought that faculty would be more open to the positive uses of GAI as they increased their own knowledge, "Professors that are more well versed in what you're able to do with it… tend to encourage the use of it."

Some disciplinary differences emerged regarding professors' acceptance of GAI. All three business students in the study mentioned that their professors encouraged acceptable uses of GAI. One student noted, "[This professor] is very encouraging of using it to analyze information." Math professors, however, warned students that GAI was unreliable for complex math. A history and economics major mentioned that history professors were more concerned with the misuse of GAI than economics faculty. Lastly, a psychology professor designed an assignment that required students to locate articles using GAI and then verify the validity of the citations. Students in this class thought the assignment was educational about the place of GAI in research.

While faculty guidance is essential, students also expressed a need for more specific instruction on crafting effective prompts, highlighting an opportunity for librarians to collaborate with faculty to provide comprehensive GAI literacy instruction.

Prompts

Given that well designed prompts are key to locating information from GAI, the authors asked students about their strategies for writing effective prompts. Students recognized the importance of providing detailed information, with 11 students reporting this as a key strategy. A participant said, "The more detail I give it, the more accurate the answer." In a similar vein, students reported that specificity was important. Moreover, some students understood the importance of providing parameters for the answer they needed. One interviewee said they would, "Give it very specific quantitative metrics like summarize this in 200 words or less." Similarly, students would include details about the desired tone and specific audience in their prompts. For example, when explaining their strategies for summarizing complex articles, one participant stated they would "Explain it as if you were talking to a child." Conversely, a student seeking a more sophisticated reply, wrote the prompt, "I am a professor writing an assignment outline for a business ethics class." Despite providing detailed information, students did not always receive useful answers from their initial prompts. Fourteen interviewees stated they frequently had to provide multiple follow-up prompts.

Students described their perceived skills at writing prompts, with 13 interviewees considering themselves skilled and one participant rating their skills as moderate. Some respondents simply described themselves as very skilled while others provided more nuanced assessments of their skills. One student reported, "[The prompts are] effective for the uses that I use them for. Do I think that they would be effective for everyone? No."

Modifying GAI Outputs into Their Own Words

When working on class projects that could be run through GAI detectors, students must be careful to avoid plagiarism by ensuring that the information generated by their prompts remains their original work. Therefore, the researchers asked interviewees how they modified the GAI outputs to transform the language into their own words. Thirteen of the students indicated that they avoided simply copying and pasting sections generated by GAI into their papers. A typical strategy was, "Just kind of paraphrase… to make it not sound AI generated." Four students described sophisticated methods for modifying and changing GAI-generated language using GAI tools rather than manually

paraphrasing. A participant stated, "I also make a summary of the summary AI gave me, and then I plug it back into AI and see like…is it still sounding AI generated?" Similarly, another interviewee said, "They have a website where if you…copy and paste something straight from ChatGPT…it basically re-words it."

Confidence

The researchers asked students about their self-reported confidence with using GAI tools. Most of the students (10) expressed a moderate level of confidence, four did not feel confident, and two said they were confident. Some students explained their lack of complete confidence in the GAI tools themselves. Seven students were unsure of the data sources GAI tools used, and an additional six students felt their breadth of expertise in using GAI tools was limited because they primarily used ChatGPT. An interviewee explained, "I'm not super well-versed in the breadth of AI tools that are available."

Closely related to their confidence in using GAI was students' perception of the complexity of GAI tools. Fifteen students found GAI easy to navigate and use, while one interviewee found it challenging. A participant said, "It's kind of scarily easy…I could probably explain it to my grandpa." However, four students discussed some caveats to their perceptions that GAI was simple to navigate. One student explained, "It has limitations in terms of its user friendliness…it would be…helpful to have someone that is more proficient in using AI to teach you."

GAI and Library Databases

We asked students to discuss how they integrate article databases with GAI tools for locating scholarly articles, and when it is more appropriate to use article databases versus GAI programs. All 16 students thought that article databases, including Google Scholar, were more effective than GAI for locating scholarly articles. Students articulated that GAI was useful for basic overviews, but lacked the depth of information available in article databases. An interviewee shared, "It's probably the depth…AI would…give you vague basic responses…the research platforms…give in-depth analysis."

The researchers explored whether familiarity with library databases influenced students' likelihood of using GAI over article databases to find scholarly sources. Most of the students reported having at least moderate knowledge of library databases. Eleven students identified library article databases for their disciplines, while the others relied on Google Scholar. Additionally, seven students found library databases more complex for searching articles, while three found GAI more challenging to use. Students reporting the library database as more complex emphasized the learning curve required to navigate the interface with comments such as, "You kind of have to type in pretty specific criteria and then you have to look through a lot of different journals." Students who thought that GAI was harder to use for locating articles focused on the challenge of identifying credible scholarly sources. One interviewee stated, "Peer reviewed journals, you know. AI can't tell what a good source is or not." Additionally, two students who believed that article databases were superior to GAI for locating scholarly articles would sometimes consult GAI when they were not satisfied with their results from library databases. A respondent explained, "The databases are the first place that I go, and if…I'm unable to

fully complete an assignment then I'll go to AI to find more resources." In a similar vein, an interviewee said, "I try to use the library databases more for research purposes, but sometimes…I can't even find what I'm looking for…I go to AI and ask them to find [me] a better article." Another student described a team member who, unfamiliar with library databases, unsuccessfully used GAI to look for peer-reviewed articles for a group project.

Students articulated the aspects of research for which they preferred using article databases versus GAI. Nine interviewees reported that they primarily began their research with article databases to find articles, then used GAI to summarize lengthy scholarly articles. A student explained, "It was helpful to find my journals first and then have AI summarize them." In contrast, four students preferred starting with GAI to gain overviews of their topics and then using article databases for in-depth information. Additionally, four participants stated that they sometimes liked to use GAI for brainstorming topics and ideas, and then they consulted article databases.

Librarians' Roles with GAI

Prompt Engineering Assistance

The researchers sought to understand how the library could best support students' GAI literacy. Recognizing the importance of writing prompts for GAI platforms, they asked students if they believed librarians could assist with crafting prompts. Nine students believed librarians could be helpful in assisting them, while six students felt prompts were simple to craft, and they did not require assistance. Students who did not think that assistance from librarians was necessary, thought that writing prompts was relatively easy. An interviewee said, "Crafting a prompt [is] not hard, because it's a chat…if it doesn't understand something… it guides you into writing a good prompt." In contrast, one student shared the insight that they believed librarians could help students write prompts to improve the results they received from library databases. The student told us, "If librarians were able to create specific prompts, and what specific databases to look at and like… what trigger words to type in." Students expressed interest in receiving help from librarians on GAI, but only if the librarians had significant expertise in the technology.

Source Evaluation and Credibility

Given GAI's reputation for creating fake citations, the researchers asked students if they believed librarians could help them verify the validity and credibility of information received from GAI. Compared to receiving help with prompts, students felt librarians could play a more significant role in verifying the accuracy of sources located with GAI. Thirteen students believed librarians could be helpful in checking the credibility of information, while only two thought this was unnecessary. A respondent thought that students who were over-reliant on GAI for research needed the most help with checking their sources and explained, "People who are using ChatGPT for a lot of their research are probably also the ones that are going to need help making sure that the information is reliable."

Students expressed interest in receiving help from librarians on GAI, but only if the librarians had significant expertise in the technology.

GAI Literacy Instruction

Students reported that most faculty guidance on using GAI focused on avoiding plagiarism rather than its positive uses. Consequently, eight students believed librarians could help instruct on appropriate GAI uses for research, while three thought this would be difficult due to varying professor policies. An interviewee explained the challenges librarians could face in recommending positive uses for GAI, "I don't think that's the librarian's responsibility. I think it's a university responsibility…if students feel like they're doing something wrong by using AI, it's very unlikely that they will go up to librarians for help." Another important consideration for librarians helping students with GAI is identifying the proper venue. Eight students thought that integrating GAI literacy into library instruction would be helpful to students. An interviewee shared, "You currently provide instruction on using databases...a similar AI walkthrough day of…the various ways that they could use it and like more advanced techniques." Another student believed that librarians discussing GAI during library instruction could help students who are overly reliant on GAI become more familiar with library databases. They recommended, "If people use AI pretty exclusively, then they're gonna like kind of tune out anything else…. if it included AI, then it kind of brings them back into… the process." Currently, the students do not view the librarians as a resource for help with GAI and all 16 respondents stated that they have never asked a librarian for assistance with GAI.

Discussion and Implications

Students shared the tasks they performed with GAI for research assignments. The leading use was improving grammar, followed by summarizing, brainstorming, locating sources, and analyzing data. These findings align with the survey of Harvard students from Deschenes and McMahon who also discovered that help with grammar and summarizing scholarly texts were popular uses. Like the current study, students were less likely to use GAI for finding sources.[31] However, the current study identified brainstorming as a more popular use of GAI. Similar to the students in the current study, the Harvard students predominantly used GAI for basic information. Deschenes and McMahson shared this quote from their survey: "AI helps in my preliminary understanding of topics, just as a Google search would."[32] While their findings about students' use of GAI were not ranked by importance, a study from Chan and Hu discovered that summarizing academic works, grammar help, and brainstorming were important uses of GAI for academic research.[33]

Interviewees emphasized that most of their professors focused on the negative uses of GAI and were less likely to tell them about the acceptable uses of GAI for research.

The current study revealed that an obstacle to students using GAI for academic research is a lack of consensus among professors about acceptable uses of GAI. Interviewees emphasized that most of their professors focused on the negative uses of GAI and were less likely to tell them about the acceptable uses of GAI for research. Students viewed professors who encouraged positive uses of GAI as outliers. This is consistent

with findings from researchers at Simon Fraser University who held focus groups discussing the role of GAI in higher education; a recurring theme was that the university and professors did not have a consensus on acceptable uses of GAI and when users crossed the line into academic integrity violations.[34] Barrett and Pack also discuss the blurred lines around what constitutes academic dishonesty when using GAI. Students and faculty differed on the acceptance of GAI for writing tasks such as brainstorming, outlining and revision. Specifically, professors were more likely than students to provide disclosure about GAI use for most writing tasks such as outlines.[35]

The lack of consensus among professors on acceptable GAI use for assignments significantly impacts librarians' efforts to promote GAI literacy. Some students want librarians to teach acceptable uses of GAI, while others find this impractical due to varying professor policies. Faculty concerns about GAI being used to cheat are well-founded, as 15 of 16 participants in the authors' study knew of peers using it unethically. The varying faculty attitudes toward GAI make librarian-led workshops on GAI for academic research risky. If a student who attended such a workshop faced issues with a professor for using GAI as recommended by a librarian, it could create significant problems. The recommendations of Evan Fruehauf, Evan Beman-Cavallaro, and LeEtta Schmidt encourage librarians to forge partnerships with campus organizations like teaching centers when promoting GAI use. Additionally, it is essential for librarians to collaborate with faculty about appropriate uses of GAI for students' research.[36] Instructing students on proper prompt citation is one way librarians can contribute to ethical GAI practices, emphasizing the importance of acknowledging the AI's contribution to the research.

Students expressed three primary concerns about GAI answers: its effectiveness at providing in-depth information, the difficulty of locating scholarly articles, and the accuracy and credibility of the information. These issues stem from GAI's limited access to scholarly resources compared to library databases and the lack of transparency about AI's information sources. Also, these concerns underscore the importance of using library databases for obtaining scholarly articles. These concerns with the ability of GAI to reliably retrieve articles are consistent with Walters and Wilder's study that discussed the problem of fake or "ghost citations," underscoring GAI's inability to consistently retrieve valid articles.[37] Some students in the current study were concerned about the lack of transparency about the sources of information GAI programs use for information. This aligns with Chan and Hu's finding that students were concerned about the lack of transparency in AI systems, stating, "The AI system is complex and opaque, which makes it difficult to understand how AI comes up with its decisions."[38] Consequently, the interviewees in the current study trusted library databases for articles and never expressed doubts about the sources of information.

Leo Lo asserts that crafting prompts is a crucial skill for librarians to integrate into their information literacy practice.[39] While some students concluded that prompt creation was a simple process that did not require any assistance, nine students in the study thought librarians could be helpful in assisting students with this skill. Students' desire for help with prompts aligns with Deschenes and McMahon's study, which found that 72.8 percent of students wanted librarian assistance with this skill.[40]

Given students' preference for using library databases to locate sources and their support for librarian guidance in crafting prompts, librarians have an opportunity to

integrate GAI into information literacy sessions by demonstrating how to use GAI to search library databases more effectively. Specifically, librarians can demonstrate to students how to use GAI to identify key themes and keywords for searching library databases. This recommendation aligns with interview findings where students used GAI for topic overviews and library databases or Google Scholar to locate peer-reviewed articles. Additionally, some students used GAI to identify types of primary sources or websites that provided leads on information sources.

Given students' preference for using library databases to locate sources and their support for librarian guidance in crafting prompts, librarians have an opportunity to integrate GAI into information literacy sessions by demonstrating how to use GAI to search library databases more effectively.

Using GAI to generate ideas for search terms could be effective because students often struggle to identify effective keywords. An important body of literature comes from research studies that observe how students search for information. Research from Helen Georgas revealed students' difficulties with searching databases using appropriate search terms; they simply used the exact search terms from their topics and often had a "lack of variety in terminology."[41] In a similar vein, Chris Leeder and Chirag Shah's research observed students searching for information about the wearables industry, with the treatment group receiving a prompt to evaluate the quality of sources before beginning their search. While the control group used less effective verbs like 'looking' or 'possible' in their keyword searches, the treatment groups employed more effective nouns such as 'financial' or 'industry,' suggesting that librarian guidance improves the quality of students' search terms.[42] Similar findings were reported in Sarah P.C. Dahlen et al.'s study, which observed students searching library databases. Students frequently reused the same keywords with little variation and largely overlooked subject headings.[43] Moreover, Andrew D. Asher, Lynda M. Duke, and Suzanne Wilson recorded students searching a variety of databases and reported that 81.5 percent of students conducted simple Google keyword searches with library databases that resulted in an overwhelming number of records.[44]

Research also indicates that many students do not spend time thinking about how to conduct searches, which could lead to ineffective search terms. Beth Bloom and Marta Mestrovic Deyrup recorded students searching databases and their study revealed that, while thirty students varied their search terms, eighteen students used the same terms and fifteen students used terminology that was too broad for useful results.[45] They concluded that, "students' search strategies indicated a lack of planning."[46] Alison J. Head and Michael B. Eisenberg also highlighted students' impulsive approach to information searching, reporting that only 36 percent of students surveyed considered their search terms before beginning their research.[47] Overall, this body of literature suggests that students need support in formulating effective keywords. By teaching students how to craft prompts with GAI to identify search terms, librarians can enhance students' ability to search databases more effectively.

Table 2.
Summary findings and implications

Theme	Summary Findings	Implications
How Students Use GAI for Academic Research	Students used GAI for grammar correction, text summary, source location, and data analysis, finding it best for basic information, with mixed success locating sources.	Librarians can clarify GAI's limitations, showcase databases for in-depth research, and introduce GAI's strengths in idea generation and summary.
Ethics of Using GAI	Students condemned GAI for writing entire essays but were unsure about the ethics of summarizing texts. Unethical peer use was common, and AI detectors seemed unreliable.	Librarians can educate students about the ethical implications of using GAI.
Faculty Perspectives and Guidance on GAI	Students sought clearer guidance on GAI use, as faculty approaches varied—some promoted it for tasks while others raised integrity concerns.	Librarians and faculty should set consistent GAI guidelines, ensuring librarians' recommendations align with them.
Prompts	Though students believe they are skilled in prompt crafting, they often require multiple attempts for desired results.	Librarians can teach prompt engineering, guiding students to create clear, specific, and effective prompts.
Confidence	Most students expressed moderate confidence in their GAI skills, and many were unsure about the data sources used by GAI tools.	Librarians can teach students about the importance of critical evaluation of GAI-generated information and explain the limitations.
GAI and Library Databases	Students preferred library databases for scholarly articles but used GAI for summarizing and idea generation.	Librarians should guide students in critically evaluating information and using GAI with databases, like generating effective search terms.

Conclusion

Although none of the 16 students the authors interviewed sought assistance from librarians for GAI, the findings clearly indicate a role for librarians if they are conversant with GAI (see Table 2). Much like the study's findings that students liked working with faculty who were conversant with GAI, they could also benefit from librarians with expertise in GAI. To best understand the limitations and possibilities of GAI, librarians should integrate these platforms into their daily work. When receiving an email research question or preparing for a research appointment, librarians should explore GAI programs to see how these tools can assist with students' research topics and search databases more effectively. By using GAI consistently, librarians can develop expertise in crafting prompts.

When Google and Wikipedia emerged, librarians and faculty were concerned about their negative impact on students' research. Over time, these tools became acceptable as students learned their appropriate role in the research process. A similar pattern is likely with GAI. In this study, students used GAI for basic information, key terminology, and idea generation before turning to article databases, much like past students used subject encyclopedias before print indexes. The main difference is GAI's increased potential for facilitating plagiarism and academic dishonesty.

Librarians, with their expertise in database searching and information evaluation, are uniquely positioned to harness GAI's strengths in generating search terms, fostering idea development, and interpreting scholarly articles. By integrating these tools into their practice, librarians can significantly enhance the research process for students. This expertise makes them ideal collaborators with faculty and campus stakeholders in determining GAI's most effective role in student research. While some believe GAI will revolutionize research and others dismiss it as a short-lived trend due to issues like ghost citations, librarians have a crucial opportunity to lead in navigating and shaping the responsible use of GAI within the academic landscape.

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Appendix A

Recruitment Email

Pepperdine University librarians are conducting a study on the use of artificial intelligence programs for research assignments by undergraduate students.

To be eligible, you must be an undergraduate student who has used artificial intelligence for at least one research paper. Eligible participants must self-identify as moderate to heavy users of AI programs.

Interviews will last approximately 30-60 minutes. Participants will receive a $50 Amazon gift card as compensation.

Participation in this interview is completely voluntary and all responses will be anonymous. This research project has IRB approval. We intend to use the results of the interview for published research.

Our goal is that this study will help the library improve efforts to instruct students in the responsible use of AI when conducting research.

If you have any questions about the study, please contact [the researcher].

Appendix B

Interview Questions

Interview questions:

1. Describe a time that you used an AI program to work on a research paper.
    a) How effective on a scale of 1-5, with five being most effective was the AI program at helping you with your research project?
1. What frustrations did you experience with the AI program?
2. How trustworthy was the information you obtained? How could you tell if the information was valid?
    a) On a scale of 1-5, with five being very trustworthy how would you rate the credibility of information you received?
1. Which AI programs have you used?
2. Which tasks are AI programs most effective at?
3. Which tasks do AI programs struggle with?
4. Tell us about any concerns you have about the ethics of using AI programs for class research projects.

5. What sort of guidance did your professor provide about AI for class assignments?
6. What strategies do you use to write effective prompts?
7. How do you modify the answers that you receive from AI to place the language in your own words?
8. What resources or people do you consult to increase knowledge of AI?
9. What sort of sources or citations were able to locate with the AI program?
10. Tell us about your knowledge of AI detection sites
11. What concerns do you have about your future career becoming obsolete from AI?
12. How confident are you in your knowledge of AI?
    a) How confident are you in the prompts you write?
    b) How sure are you that you are finding useful information?
    c) On a scale of 1-5, with five having strong confidence, where would you rate yourself in your knowledge of AI tools

1. Tell me your thoughts on the complexity of using AI
2. Describe your peers' use of AI. Are they using AI to cheat?
3. Could librarians play a role in helping your craft prompts and check the validity of citations?
4. Tell us about your use of Library resources such as the catalog and databases
    a) How do these sources compare with AI tools for research purposes
    b) On a scale of 1-5, with five having strong confidence, where would you rate your knowledge of library resources

1. In what ways do you combine AI tools and library databases to gather information for your assignments?
2. How do you decide when it's more appropriate to use AI tools versus consulting traditional library databases for your research needs?

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