Navigating AI-Assisted Literature Reviews in First-Year Engineering

Esther Tian and Maggie Nunley
University of Virginia

In our institution, all first-year engineering students take a two-semester sequence of Engineering Foundations (EF 1 in the fall and EF 2 in the spring). In EF 2, student teams work on semester-long, client-based design projects. These projects guide students through the design process, from problem definition and ideation to prototyping and testing. A crucial component during the early stages is the literature review, an opportunity for students to ground their problem understanding, investigate existing knowledge, identify gaps, and provide evidence for design decisions. This component has often been challenging for students. Many rely on surface-level internet searches rather than engaging with scholarly sources, largely due to limited familiarity with academic literature and its relevance to engineering design. As a result, literature reviews tend to lack depth, critical analysis, or meaningful integration into their project work.

To address this challenge, the course instructor began collaborating with the engineering librarian in Spring 2024, who led an in-class session on traditional search methods using university library resources. Students were introduced to library databases, search techniques, and source evaluation. We modeled how to narrow a topic, identify effective keywords, and locate peer-reviewed articles. Many students were unfamiliar with these methods, and the session helped demystify academic research. But as Generative AI (GenAI) tools like Consensus and ChatGPT gained traction, we began to consider how such technologies might reshape students' approaches to the literature review.

With GenAI becoming increasingly accessible, students started experimenting with these tools on their own. An immediate question arose: how do we guide students to use AI responsibly? On one hand, we saw the potential for AI tools to scaffold the literature review process, especially for students with limited research experience. On the other hand, many first-year students had limited awareness of AI tools beyond ChatGPT and were largely self-taught in their use. They often lacked understanding of the need to verify sources. More generally, the librarian had already seen students struggle to locate AI-suggested articles or cite sources that these tools hallucinated when assisting undergraduate research across disciplines.

At stake was finding a way to help students engage with GenAI tools ethically and effectively, using them to enhance, not bypass, their learning. As an introductory course, Engineering Foundations offered a timely and important opportunity to develop students' AI literacy. We recognized that introducing students to AI-assisted academic research tools would not only aid their immediate project work but also lay a foundation for thoughtful and responsible use of AI in their future studies. Our aim was to create a space where students could begin exploring how to leverage these tools while understanding their limitations. Specifically, we hoped that AI tools would support students in conducting broad, exploratory searches, identifying academic sources, and building the skills needed to interpret and evaluate those sources critically.

We redesigned the literature review instruction and assignment to explicitly incorporate both traditional and AI-assisted search processes. We began with traditional research methods. Students were instructed to create a research plan based on their client problems, followed by hands-on exploration of the library's databases. We highlighted the iterative nature of searching, reviewing results, and refining search terms. Students selected library resources to find relevant information and shared them with their teams. We checked in with each team to offer suggestions and recommend different resources.

We then introduced students to Consensus, an AI-powered search engine. By demonstrating how to access it through the library website, we framed it as another academic search tool, encouraging students to use it to *find* sources, not *replace* the work of analyzing them. We selected Consensus because it draws from reputable sources like Semantic Scholar and OpenAlex, which reduces the risk of hallucinated citations. Its structured interface resembles that of academic search engines, supporting continuity with the research strategies introduced earlier. Additionally, the library provides all students with a free Consensus Pro account, ensuring equal access to the tool. We showed students how to craft effective prompts and reviewed how Consensus presents claims and citations. Most importantly, we emphasized the need to verify sources by accessing full articles through trusted databases and critically evaluating their credibility and relevance.

The revised assignment was designed as an individual task to ensure that each student developed core research skills and gained experience with the literature review process. Students conducted their own reviews tied to their team's project and organized their findings into two or three thematic areas. Each theme was developed into a paragraph with summary, evaluation, and explicit connection to their project. Students who used GenAI tools were required to include: (1) The exact prompt(s) and AI tool(s) used; (2) Full AI-generated responses; and (3) An explanation of how each source was verified using university library databases or other credible resources. Literature summaries and evaluations were expected to be the students' own work and to clearly connect to their project. GenAI tools were permitted for search purposes but had to be used transparently and responsibly. Later in the semester, individual reviews were synthesized by teams into a collective literature review as part of their final project report.

Integrating GenAI tools into the literature review process led to several positive outcomes. Students were more engaged with the research process. Those who used Consensus often found high-quality, relevant sources they might not have otherwise encountered. The requirement to verify AI-suggested citations encouraged meaningful interaction with full articles rather than over-reliance on summaries. Of the students who completed a post-assignment survey, most of them found that AI tools were moderately, very, or extremely helpful in their literature search. One student commented, "[it] significantly streamlined the process of finding quality sources for my literature review." Similarly, a large majority of respondents reported moderate to high confidence in their ability to use AI tools effectively, and rated the information provided by AI tools as moderately to extremely accurate and reliable. Students also demonstrated increased critical thinking. One student noted, "early-on in the research process, it is hard to know exactly what you are looking for. In this early phase of research, source discovery tools such as Consensus AI are great at getting you started. As you learn more about the topic and focus your field of interest, AI tools become less effective, and traditional search methods become more fruitful." (The study was approved by the university's Institutional Review Board for Social and Behavioral Sciences, Protocol Number: 6614.)

From an instructional perspective, we found tremendous value in being able to examine and contrast different approaches to literature review in real time with our students. Engaging directly with them about the affordances and limitations of GenAI tools created opportunities for meaningful dialogue about research practices in the current technological landscape. It was especially rewarding to observe students actively triangulating between resources, for instance, beginning their search with Consensus to identify key terms and broad concepts, then transitioning to traditional library databases for deeper, more targeted research.

We see this effort as part of an ongoing experiment in responsibly integrating GenAI into undergraduate education. In future semesters, we plan to spend more class time modeling source verification strategies, incorporate peer review checkpoints for students to give and receive feedback and collecting additional data on students' experiences. We are also considering the development of a student research guide on how to effectively pair GenAI tools with traditional academic resources.

This experience has reinforced the importance of blending traditional research instruction with emerging AI tools. Students need both critical thinking and technical fluency to navigate today's complex information ecosystem. Given the growing presence of GenAI tools in students' academic lives, our role as educators is to help students use them wisely. When thoughtfully embedded into assignments with clear expectations for source verification, critical reflection, and academic integrity, GenAI use can become a powerful catalyst for student learning. While we are still learning how best to guide this integration, we now view AI-assisted literature reviews as an essential element in teaching the engineering design process, one that helps students engage more deeply with research, make more informed design decisions, and develop responsible research habits that will serve them well beyond the classroom.