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The ISP and GenAI Crossroads: A Student Crossroads Between Information Searching and Ethics in Intro to Engineering Courses

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Abstract:

Abstract

As generative artificial intelligence (GenAI) becomes increasingly integrated into higher education, there is a growing need to understand its impact on students' information-seeking behaviors, particularly during academic research. This study explores the intersection of GenAI and Kuhlthau's Information Search Process (ISP) model, which frames information seeking through affective, cognitive, and physical dimensions. Drawing on semi-structured interviews with first-year engineering students engaged in a course-integrated GenAI research assignment, the study uses a grounded-constructivist approach to identify emerging themes. Preliminary findings reveal that students experience emotions such as doubt and frustration related to GenAI output, demonstrate cognitive awareness of information quality, and exhibit a range of behavioral responses—from accepting flawed data to validating or avoiding GenAI use. These insights suggest that structured instruction can foster GenAI-related information literacy, and that the ISP model remains a valuable framework for understanding student engagement with new technologies. The findings highlight opportunities for librarian-instructor collaboration in designing effective GenAI-integrated research instruction.

Introduction

Generative AI is increasingly becoming an integral part of instructional practices in higher education courses, and it is beneficial to understand this technology's impact on the student research experience [1]. Over time, the field of library science has used the Information Search Process (ISP) model to examine the stages of the user experience in the search process. ISP examines information seeking through the lens of the affective (feelings), the cognitive (thoughts), and physical (actions) [2]. The prominence of GenAI has sparked a need to build understanding around the experience and application of this technology within student research. Information seekers are repeatedly required to evaluate information to determine its relevance, appropriateness, accuracy, and completeness [3]. While helpful, new technology usually adds to the user's apprehension and frustration. The information obtained from GenAI tools has unclear authority and source information, so users are burdened with double-checking or validating its output. The overlap of the foundational principles within the ISP, specifically the affective, cognitive, and physical, needs further investigation to determine the information-seeking experience while utilizing GenAI for academic purposes.

The current study aims to find areas of intersection between the ISP and GenAI for research within a course assignment. Six students were interviewed following an introductory engineering course in which GenAI was integrated into a research project. Grounded-theory analysis was conducted to find commonalities with the ISP framework while using GenAI as part of a research component within a course assignment. Librarians and professors can use this research to guide GenAI research instruction and begin to pinpoint common student experiences. This research sets a foundation for examining the correlation between GenAI and ISP and the need to explore the intersection of ethics in the process.

Literature Review

There are decades of research on Dr. Carol Kuhlthau's Information Search Process. Still, additional research is needed as technology changes, such as with the rapid integration of GenAI within the research process. Due to the gap in the literature involving an intersection of the ISP, GenAI, and ethics, the literature review walks through the existing research and needs on each of these topics. The purpose is to explore areas for future investigation, building on key scholars within the field.

The Information Search Process (ISP) is a framework used to guide students through the research experience for decades. Foundational research by Kuhlthau [4] and others focuses on understanding the student experience through ISP to improve teaching and learning outcomes.

As new technologies and advances in the research landscape emerge, it is pertinent to examine the experience through the ISP to find areas of intersection. Research has become faster with internet-based tools, including GenAI, which is readily available, and constantly finding new ways to improve the process. The prevalence of inaccurate sources and the need to validate information has created another cognitive load for researchers that often results in frustration and uncertainty as they learn to navigate GenAI in their research process.

Past exposure to technology and experiences using GenAI also significantly impact the research process. Students are often asked to research complex problems and experience uncertainty surrounding combining searching and problem-solving [5]. The ISP describes six stages of research: initiation, selection, exploration, formulation, collection, and presentation [4].

Understanding the ISP for students during all stages and through the feelings, thoughts, and physical reactions with each phase can normalize the often uncomfortable process for students and serve as a teachable reminder to persist. There is power for students in understanding the ISP and knowing that uncertainty and discomfort are part of the process. Without this knowledge and framework, students can quickly become discouraged and create situations where ethics come into play [6], [7]. For example, the discomfort of facing feelings of uncertainty can cause students to give up on their search or decide to use technology, such as GenAI, as a crutch to avoid this discomfort. The lack of understanding of the search process can result in a variety of concerns, from lessening student engagement to violations of acceptable use and plagiarism policies. Kuhlthau's findings and other subsequent studies demonstrate that thought-based research involves emotional and physical responses [4], [6], [8]. Understanding these responses strengthens the need for instruction on the search process, especially as technology continues to change the research landscape and potentially tempt students who are unaware of the need for frustration and uncertainty within the process.

Supportive Interventions

Despite the complexity of research and the quickly changing GenAI capabilities, ISP research has pointed to key support interventions to help students navigate the process. For example, professors guide students through the research process with scaffolding and intentional assignment design. This is easier said than done, and the constantly changing nature of GenAI in research has left many educators avoiding the topic altogether [1]. Avoiding the topic often leaves students feeling lost or perceived the need to keep their use a secret to avoid scrutiny due to a lack of understanding. This does not stop the stages of ISP, but severs communication and isolates students. This feeling of isolation at a pivotal moment of discovery can stunt the learning and discovery that happens in the exploration, formulation,

collection, and presentation stages of ISP [9]. Anderson describes the impact of persistence in the uncomfortable research moments for students. The research confirms that uncertainty and anxiety within the ISP, often leads students to moments of growth and engagement [5]. Anderson speaks of the "margins of uncertainty" and describes an example of a student who used frustration to clarify their thinking on their topic [5].
With interventions in place, the productive struggle of uncertainty in the research process can create student ownership of their research, learning, and understanding.

Professors play a key role in student research, but librarians are often an under-utilized resource in the process. The evolution of technology has often led to the perception by students and faculty that information retrieval is now easy [10], [11]. There is evidence that information literacy and a close examination of concepts such as ethics in research are more essential than ever.
Hersh [12] explained that in the GenAI era of research, many large language models (LLM's) "may provide functionality that aids the IR [information retrieval] process, the continued need for search systems, and research into their improvement, remains essential." The speed of progress with GenAI in research requires a partnership between the professor and librarian to leverage each other's skills to stay on top of the research capabilities in the field [1]. Bridges, et al., [1] research the role of librarians in GenAI and posed key areas of focus for libraries. The topics range from librarians considering and teaching ethics surrounding GenAI, policies and potential collaborations.

Collaboration & ISP

Kuhlthau's ISP research focuses on individual research, but her later studies of inquiry design highlight key considerations in collaborative research [4]. Further research findings on the application of ISP in a group dynamic demonstrate both beneficial and adverse effects on learning depending on several factors [6], [8]. Components such as group structure, work distribution, and member engagement all impact each individual's learning outcomes and experience. There are many benefits, but it is essential to provide intervention points and additional learning opportunities to offset any negative experiences surrounding group research [8].
Hyldegård [8] conducted a study on group experiences during information-seeking and determined that the ISP model applies in several areas in a group setting. When using the ISP model to examine group based research, it is important to consider group dynamics and behavior.
According to Hyldegård [8], interviews, observations, and project analysis, led the researcher to the conclusion that the "turning point" resulting from grappling with frustration did not fully evolve in the group setting. A combination of group and individual learning experiences helps to provide a variety of opportunities for students to work through all the stages of the ISP.

Methodology

The current investigation is part of an ongoing collaboration between an Engineering Fundamentals professor and the Engineering Librarian at a large suburban university in the Southeast. In this study, a purposive sample of six students in an Introduction to Engineering course participated in semi-structured interviews regarding the student experience of course- integrated GenAI research in their class.

Researchers utilized Charmaz's constructivist grounded theory to analyze the data [13]. ChatGPT-3.5 was not utilized in the analysis or in writing this article. This study was approved by the Institutional Review Board (Reference Number 794713) at the University of Louisville

Participants

All study participants were enrolled in the Introduction to Engineering course at the University of Louisville in Spring 2024 semester. To gather a diverse sample of participants, researchers administered a survey at the end of the semester with questions about GenAI experience and demographic information (sex and race) and invited students with varying responses to the questions. From this, participants were selected based on three criteria for the purposive sample: (1) consent to be contacted for an interview, (2) self-reported experience with GenAI, and (3) a goal of diversity and representativeness. All identifying information was removed to protect participant confidentiality, and individuals are referred to by pseudonyms such as Participant 1 (P1) throughout the study. This pre-survey is available upon request.

GenAI Integration

GenAI instruction was integrated into the Introduction to Engineering course at three points in the semester: in an in-class discussion following an engineering ethics lecture, as a low-level integration in a team research report, and in a fully scaffolded integration with Python programming in the course's final project. OpenAI's ChatGPT-3.5 was the leading tool freely accessible in Spring and thus was the basis for the course integrations. For more information on the in-class integrations, see [14], [15]

Interviews

The engineering librarian researcher conducted individual semi-structured interviews lasting approximately 30 minutes per participant. The questions were structured around Schwartz's ethical decision-making framework [16] and intended to investigate students' ethical decision-making regarding GenAI. The

interview questions are available in Appendix A.

Analysis

Researchers applied the constructivist grounded theory to analyze the participant data [13]. Both researchers independently reviewed all 6 interview transcripts and coded relevant words. Coding was performed both by hand and in Microsoft Word and Excel documents. Researchers met frequently during the coding process to discuss (a) coding strategies, (b) highly-relevant words, and (c) preliminary category ideas. Grounded Constructivist grounded theory involves an iterative coding process that constantly makes meaning and evaluates the meaning and connection of participant responses [1]. In this case, the focus was particularly in relation to their area of study and the context of their academic careers with GenAI and engineering research.
The transcripts were coded first by word and phrase (ex. Chat GPT, code, Python, output, confused), and then combined into categories based on all the participant data (ex: emotional response to use, method of application, attitude towards GenAI, research use of output). After further analysis of the data from the categories, themes emerged and were reviewed from an ISP lens, and findings are presented below. When all transcripts had been coded, researchers came together and organized all words into common themes using visual tools and shared Microsoft documents. The full coding table illustrating the alignment of emergent themes with ISP stages and GenAI behaviors is provided in Appendix B. The findings are presented below.

Positionality statements:
Positionality statements are included within this research due to the proximity of the researchers to the students within the study.

Author 1 is an engineering librarian and instructor in the Research and Instruction Department of the University Library System. She has focused on education and curriculum research, specifically in the STEM fields. Currently, she has been focusing her instruction and research on GenAI and the implications for students. She believes that GenAI presents the opportunity to enhance student research and job preparation starting with discipline-specific, application based instruction.

Author 2 is an assistant professor in the Engineering Fundamentals department of the university. She has been focusing both her teaching and research projects on GenAI since it became public, having observed and witnessed both opportunities to enhance student learning and threats to learning. She is relatively optimistic about the use of GenAI and believes that students can learn how to use it well.

Findings

The initial data shows evidence of several points in the ISP where the affective

(feelings), cognitive (thoughts), and physical (actions) realms of experience intersect with the student's experiences utilizing GenAI. Through a grounded constructivist model of coding, the interviews consistently highlighted themes that demonstrated an intersection of GenAI research with the six stages of the ISP. From the interviews, we found three main themes that related to the ISP framework: uncertainty in the technology, the benefit of groupwork while learning GenAI, and an attitude shift or "turning point" due to the course integration. Additionally, we found evidence of ethical considerations in regard to research decision-making intertwined throughout the student experience.

Uncertainty

In the ISP, background knowledge and experience play a key role in the student researcher's comfort [2], [4], [11], [17]. In this study, the participants' experiences and exposure to GenAI varied, but five participants experienced skepticism and uncertainty toward GenAI before the class. P1 described their view of GenAI as a "cheating tool" and expressed fear of academic misconduct that, in their opinion, wasn't worth the risk of use. P5 described their initial thoughts on using GenAI on an assignment as "icky" because it was a gray area that made them uncomfortable. The participants with limited GenAI exposure consistently approached the tool with apprehension at the start of the assignment. Their uncertainty was based on various factors, but P2 described a significant concern over the accuracy of the information, explaining, "You don't know exactly if what you are seeing is 100% correct". The fear of misinformation was consistent among the participants with less experience using GenAI. Another concern for the participants was the fear of not truly learning the information.

All six participants voiced a need to understand the engineering skills being taught in the class. P5 explained a common concern among the participants, their initial question, "How am I gonna use it without, you know, ruining the integrity of what's trying to be taught?" All participants described an obligation to understand the content because it was in their field of study. They all explained that courses within their major felt different because they needed to gain these skills for their future. Some of these beliefs echo the lecture by the Engineering Fundamentals professor on engineering ethics. This lecture was intentionally given in tandem with the GenAI assignment to help students understand the ethics and integrity of the profession, as well as the technology tools available to help them along the way. P3 described their process for fact-checking and gaining their understanding, "I don't take the answers out of like face value, I double check afterward…usually, I would still check the calculations". All participants spoke of the limitations of GenAI in their field and their need to understand and check the work.

In this study, students were researching for their project and explicitly assigned to

utilize GenAI in the process. Five of the six participants expressed unease and skepticism at this direction, but all six participants described feeling relieved at the clear guidelines provided by the professor for the assignment. Participants expressed a lack of direction in most of their previous academic experiences. This aligns with current research on GenAI in higher education, which calls for improving policies and open dialogue surrounding GenAI usage [7], [18], [19], [20].

The initial concerns and lack of trust are in alignment with the early stages of the ISP [2], [4], [17]. The constant intersection of feelings, thoughts, and actions was demonstrated by all six of the participants as well, regardless of their familiarity with GenAI. P3 expressed an increased level of comfort with utilizing GenAI in engineering, but also expressed concerns around potential ethical concerns with lost learning due to an overreliance on GenAI. Although this looked different in each interview, all six of the participants spoke of a grappling between GenAI, ethics, and their research. The feelings of frustration were framed by the intentional scaffolding by the professor. Within the class, students learned about engineering ethics, GenAI, and research applications in a strategic order to build a schema surrounding their assignment. This scaffolding is a key component of the ISP [2] and also researched to strengthen understanding in GenAI application [7], [18], [19] in an academic setting. Ethics was consistently weaved throughout the student responses. The intersection of ethics and GenAI has been and continues to be studied, examining these topics through the ISP could build upon a well-researched model.

Groupwork

Participants consistently spoke of the impact of peers on their decision to use GenAI and how to apply it to their engineering work. The project assigned in the Intro to Engineering class, with explicit expectations to use GenAI within the project, was performed in a group. The group setting appeared to greatly impact the decision-making and interactions with GenAI for many participants, specifically those with less experience. The participants with the least experience using GenAI began the group assignment by describing their prompts more broadly. P4 explained the process and change throughout the project, “for the group when you started using AI for the first assignment, it was, like most of us, [our] first diving deep into it, getting word for word. But then, when you go to learn about the ethics while using it, it will change their perspective.” P4 explained that over time, the group learned through trial and error the benefits of prompt generation and how to consider ethics within the work. Trial and error felt less personal in a group setting, and participants gained confidence in using GenAI in the assignment. P1 explained starting as initially typing in the entire prompt by copying and pasting because they felt that they were using it “as recommended by our instructor”. As the group gained familiarity and a

level of confidence, they were able to more confidently create prompts outside of the explicit directions. P2 described an exploratory process where their group learned that the best way was to give a “specific prompt where we told it exactly what we needed it to do [step by step]”. Each member of their group contributed to finding errors and thinking of additional prompts. P2 described this as a moment of learning as “cool,” “useful,” and a “good resource,”
despite having moments in the process where their work was “frustrating.” The group exploration described the moment that P2 stopped speaking in terms of fear and began to refer to GenAI regarding engineering as a “knowledgeable peer”. The group learning experience served to build confidence and encouraged exploration. Five of the six group members described this process as helpful in understanding the capabilities and limitations in a hands-on, team-oriented manner.

Attitude Shift/Turning Point

The ISP describes a pivotal research moment, known as the "turning point", where frustration transforms into understanding [2], [5], [8], [21]. Five of the six participants described this attitude shift moment through a variety of experiences. The experiences ranged from trial and error with prompt generation, moments of group discovery, and gained understanding from their research. Anderson researched the moment of frustration that leads to discovery and engagement [5].

The participants consistently revealed a turning point: a shift in their attitude toward using GenAI in their research assignments and beyond. Five of the six participants voiced apprehension and even confusion about having a professor not only allow but also require GenAI on a coding project. All participants described the direct instruction to use GenAI as outside of the ordinary in their academic experience. The lack of clear communication left many participants scared or unwilling to use GenAI in classes where the use policy was unclear. P2 described this lack of communication, saying, "I don't feel like most professors mention it,
because, you know, [it's] kind of like an unspoken thing. If they don't say you can use it, you probably shouldn't." The unspoken implication that even bringing up this topic sounds like cheating was insinuated by all participants. The moment of clarity from the clear instructions provided all of the participants with clear guidance and understanding of the expectations. P4 described the dynamics change in using GenAI after the explicit directions given by the
professor, "when you're told like, you can use it, it opens the dynamics of what you can do with it. So you don't constrain yourself…". This quote describes the feelings of several of the participants feeling encouraged to discuss GenAI in academics for the first time.

While all of the participants appreciated the clear boundary regarding the use of GenAI on the assignment, a shift in their belief towards GenAI in academics often occurred in the midst of the assignment. While five of the six participants voiced concern over using GenAI in an academic setting prior to the assignment, all of the participants described a change and a new sense of clarity surrounding GenAI ethics in an academic setting. Although some participants grappled over the line of when GenAI was ethical, all of the participants agreed that they would use GenAI again on a similar project and that GenAI was acceptable and useful to help with homework. P1 described a common view of participants towards using GenAI on homework. P1 explained, "The homework is supposed to prepare you for the exam. So if you, especially when you're doing something that you don't have access to like an instructor or somebody who could provide that kind of role for you." This was a major shift for four of the six participants. Initially the four apprehensive GenAI participants described their concerns using words like "fear"

(P5), “cheating” (P1), and risk (P2). The direct instruction to utilize GenAI gave them the opportunity to utilize the tool and learn the limits through application and instruction. In this process, all of the participants were able to see that it was a useful tool when used correctly. The powerful moments of change and discovery happened not through a lecture, but in editing prompts to generate the desired output and learn the capabilities and limitations of GenAI in engineering. P6 described their experience in using GenAI as interacting with a “teaching tool”. All of the participants realized the tutor-like homework help that GenAI could provide on engineering assignments and all expressed plans to use it to check their work and get help on problems when they were stuck. The participants varied in their beliefs of the ethical use of GenAI beyond homework, but all described a boundary of some sort that should not be crossed. P1 described his moving line of morality based on the learning outcome stating, “It just depends a lot on what you're doing and what you're using it for, and like what the role, what the assignment is actually like asking you to accomplish…what skills they want to help grow”. All of the participants echoed P1’s belief that GenAI use in an academic setting was situational.

Thanks to the interventions in place in this study, the students could persevere and reach new understanding. Consistent with Anderson’s findings [5], student researcher persistence provided opportunities for understanding. The interviews revealed that the “turning point” was not limited to the assignment's learning objectives but also created an understanding of GenAI. Despite five of the six participants feeling skeptical initially about GenAI within an academic setting, following this assignment, all six participants said they believed GenAI enhanced their learning. Many participants explained that they would now comfortably use GenAI as a tutor or homework help option. This is a complete change, and much like the exposure and grappling in the ISP process, a similar process with GenAI seemingly occurred. More research is needed on the impact of course-integrated instruction for specific disciplines. The students described in detail the limitations and areas of strength for GenAI in engineering. Most of their knowledge was gained through hands-on application in a controlled, professor-led assignment. The need for librarians and professors to have clear and direct instruction and learning opportunities surrounding GenAI in academics is in alignment with the research within the field [1], [10], [20].

Limitations

This study was conducted at one institution following a unique in-class integration of GenAI, limiting the generalizability of the findings. The sample size was also small, but reflective of the class size. Additional studies, with increased interview data is needed to expand upon these findings. However, as this is one of the first studies investigating the information search process with GenAI at the undergraduate level, the findings are relevant and can be impactful and lead to

future research.

Conclusion

This initial study revealed early findings on several points of intersection between the ISP and GenAI. Key factors at play within the information search process using GenAI are the impact of student background and experiences; mentions of feelings, thoughts, and actions; and the attitude shift, or "turning point," achieved due to a scaffolded intervention. Ethics was also consistently mentioned as a key factor in the student's research process. The interviews shed light on the new territory that GenAI is venturing into at a rapid pace.

Research needs to press forward to build knowledge for librarians and their collaborators to provide timely and impactful instruction within the academic setting. The opportunity to build on the work of the ISP model with GenAI technology application would work to advance instruction and the student experience.

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Appendix A

1. What was your educational experience utilizing technology before Speed School?
2. What are your initial thoughts about using Generative AI tools, such as Chat GPT, for personal use?
    a. Have you used this tool before for personal uses?
    b. Do you plan to use it again?
3. What are your initial thoughts on generative AI, such as Chat GPT, for academic use?
4. Think back to when you were instructed to use ChatGPT at the beginning of the Grand Challenge research project in ENGR110. Was that your first time using ChatGPT or other generative AI tools?
    a. How did you and your team use it? What kinds of prompts did you use? How did you use the results?
    b. How did you feel while using generative AI for this assignment?
    c. Might you use it again for a similar assignment?
5. Have you used or considered using ChatGPT for an assignment in another class where there were no instructions to do so?
    a. What were your experiences using or deciding not to use it? For example:
        i. What made you think of using it?
        ii. Did you have to think twice about using it? If so, how did you decide what to do?
        iii. What emotions did you feel while using generative AI for this assignment?
        iv. How did you reason-through using it? And
        v. How did you use the output?
6. Do you feel that you need to consider ethics when using generative AI in an academic setting?
    a. Do you believe any outside situational reasons could change the decision to use generative AI, ex: classmates' use, time, resources, etc?
7. Do you believe using generative AI in an engineering class impacts your learning?
    a. Do you feel that this impact is positive or negative, or situational?

Appendix B

Constructivist Grounded ISP and GenAI Coding Table

Theme	ISP Stage(s)	Constructivist Focus (Charmaz)	Representative GenAI Behavior	High-Frequency Words	Example Codes / Quotes
1. Uncertainty in the Technology	Initiation, Exploration	Meaning-making under ambiguity; ethical discomfort	Hesitant prompting; concern about correctness and learning loss	frustrating, worried, suspect, cheating, think	"I was worried about misinformation" (P2), "It felt icky" (P5), "How will I actually learn?" (P5) "I double-check everything, I don't take it at face value" (P3)
2. Groupwork as a Buffer	Exploration, Formulation	Learning co-constructed through peer dialogue and support	Prompt refinement; shared risk-taking; collaborative trial/error	project, help, track down, resource, search	"We figured it out together" (P2), "Trial and error didn't feel so risky with the group" (P4) "The group helped me feel less nervous about getting it wrong" (P1)
3. Turning Point in Attitude	Formulation → Collection → Presentation	Reflective transformation through structured engagement	Increased confidence; reframing GenAI as educational support	chatgpt, homework, positive, teaching tool, time	"It became a tutor, not a cheater" (P6), "Now I use it to help me understand" (P1) "When you're told you can use it, it opens

					the dynamics” (P4)