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Integrating Perplexity AI into Academic Research: A Study on Research Gap Analysis and Proposal Development

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Abstract. This study examines how Perplexity AI is integrated into academic research, particularly its role in research gap analysis and proposal development among university students. Using a qualitative descriptive method and questionnaire data from 32 participants, the research explores students' perceptions, benefits, and ethical considerations regarding AI- assisted research. The findings reveal that Perplexity AI improves efficiency in literature review and research gap identification, with 75% of students using it to explore research topics and 65.6% acknowledging its usefulness in recognizing trends and gaps. However, concerns remain about accuracy and source reliability, as only 56.3% fully trust AI-generated results, and many still verify information manually. The study concludes that effective use of Perplexity AI requires strong AI literacy that includes critical thinking, verification skills, and ethical awareness. These insights contribute to a broader understanding of human–AI collaboration in academic settings and highlight the need for responsible, well-guided integration of AI tools in research education.

Keywords: Academic Integrity; AI Literacy; Proposal Development; Research Gap; Student Perceptions

1. INTRODUCTION

From an AI perspective, the integration of Artificial Intelligence (AI) into academic research has changed how researchers identify research gaps and develop proposals. AI allows users to explore large amounts of data, summarize information, and point out areas that need more study, which are key parts of research gap analysis. These abilities help scholars create clearer research goals and build well-organized frameworks for proposal development. In the academic setting, AI acts as both a thinking and analytical partner that improves decision-making, efficiency, and innovation. Therefore, the connection between AI, research gap analysis, and proposal development shows a new academic pattern where technology supports human creativity and critical thinking in producing scientific knowledge.

According to Duong (2024), students' positive perceptions of AI usage significantly correlate with their willingness to adopt AI-assisted tools in academic research settings, suggesting that AI can reduce barriers in literature exploration and proposal development. Abou Elmagd (2025) further observed that AI integration in English language and literature research enhances analytical capabilities and the efficiency of identifying research gaps, albeit with risks such as diminished critical thinking and ethical concerns. Winarti et al. (2025) found that in EFL contexts, AI tools improved students' abilities to design coherent thesis proposals by providing structured support for writing and idea generation. These findings reinforce the idea that AI tools like Perplexity AI play a vital role in bridging the gap between information

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retrieval and research design, enabling students to create more structured, evidence-based, and innovative proposals. However, all studies also caution that human judgment and ethical awareness remain crucial to preserving academic integrity and authenticity.

This study focuses on exploring the role of Perplexity AI in facilitating research gap identification and proposal development among university students and researchers. Specifically, it aims to analyze how AI tools influence the effectiveness, accuracy, and creativity of academic research planning. The expected outcomes suggest that Perplexity AI enhances efficiency, improves research quality, and promotes deeper analytical reasoning when used responsibly. Therefore, this study seeks to contribute to a broader understanding of how AI can be integrated ethically and productively into academic research to foster innovation while maintaining scholarly rigor and human oversight.

2. LITERATURE REVIEW

Artificial Intelligence (AI) has significantly reshaped academic research, offering new ways to collect, analyze, and interpret information. According to Russell and Norvig (2021), AI enables systems to simulate human reasoning and decision-making, allowing for more efficient problem-solving in complex cognitive tasks such as research development and proposal design. Within this context, AI-based platforms like Perplexity AI have emerged as intelligent tools that assist researchers in identifying research gaps, synthesizing literature, and structuring academic proposals effectively.

Recent studies emphasize the role of Perplexity AI as a multifunctional tool in academic writing and research. Patia et al. (2025) found that Perplexity AI supports users in literature review, idea generation, and research gap identification, helping to build more coherent and evidence-based research proposals. Similarly, Sudi et al. (2025) showed that training students to use Perplexity AI enhances research quality and efficiency, highlighting its importance as a supportive instrument in higher education. Both studies indicate that integrating Perplexity AI into research practice encourages critical and analytical thinking.

In the area of academic writing, Lubis and Rahman Hz (2024) revealed that Perplexity AI improves writing efficiency among EFL students by offering relevant resources and structural guidance. Hasanah et al. (2025) also reported that students perceive Perplexity AI as helpful for improving writing accuracy and organization, although they caution against overdependence on AI-generated content. These findings align with Bailey (2015), who emphasizes that academic writing must still prioritize critical engagement and original thought, even when supported by digital tools.

Comparative studies further demonstrate the advantages of Perplexity AI in academic contexts. Raza (2025) compared ChatGPT and Perplexity AI, finding that Perplexity produces more concise, source-based, and evidence-oriented information suitable for scholarly work. This makes it particularly useful for research gap analysis and proposal development, where precision and credibility are essential. Additionally, Hwang and Lee (2025), as well as Woo and Cho (2025), found that human–AI collaboration promotes creativity and self-regulated learning when students are guided to use AI responsibly within academic settings.

Supporting this view, the Center for Innovation, Design, and Digital Learning (2024) asserts that the integration of AI into education promotes innovation and accessibility, helping learners engage more effectively with digital resources. This reinforces the notion that AI tools like Perplexity are not mere shortcuts but catalysts for more informed and structured academic inquiry.Overall, the reviewed literature suggests that integrating Perplexity AI into academic research enhances efficiency, clarity, and critical engagement in both research gap analysis and proposal development. While the technology offers significant benefits, its effective use depends on users' digital literacy and ethical awareness. Thus, future research should explore frameworks for incorporating Perplexity AI responsibly into research education, ensuring that technological assistance strengthens, rather than replaces, human intellectual contribution.

Several previous studies have highlighted the growing importance of integrating Perplexity AI into academic research to improve writing efficiency, analytical reasoning, and ethical awareness. According to Russell and Norvig (2021), intelligent systems simulate human reasoning to support structured decision-making, forming the theoretical basis for AI-assisted research. Building on this, Bailey (2015) emphasized that academic writing requires critical thinking and organization, which AI tools can enhance. Lubis and Rahman (2024) and Hasanah et al. (2025) found that Perplexity AI improves students' writing accuracy, coherence, and efficiency. Patia et al. (2025) showed that it helps identify research gaps and develop well-structured proposals, while Raza (2025) confirmed that Perplexity provides concise, evidence-based academic outputs. In Indonesia, Sudi et al. (2025) revealed that AI socialization enhances research quality. Studies by Hwang and Lee (2025) and Woo and Cho (2025) further noted that human AI collaboration fosters creativity, independence, and reflective thinking. Lastly, the Center for Innovation, Design, and Digital Learning (2024) asserted that AI supports inclusive and innovative learning. Collectively, these findings affirm that Perplexity AI serves as an effective academic partner in research gap analysis and proposal development.

3. METHODOLOGY

This study employed a qualitative descriptive approach to explore students' perceptions and experiences in using Perplexity AI for research gap analysis and proposal development. The qualitative descriptive method was chosen because it allows the researcher to provide a detailed and contextual understanding of participants' responses without manipulating variables. Data were collected through a Google Form questionnaire, which consisted of open-ended and close-ended questions designed to capture students' opinions, attitudes, and reflections regarding the use of AI tools in academic research. The questionnaire link was distributed to undergraduate students from various departments, ensuring diverse perspectives on how Perplexity AI supports their research activities. The data collection process took approximately two weeks, during which responses were gathered, validated, and categorized according to thematic relevance.

The data analysis process in this study integrated narrative analysis to obtain a comprehensive understanding of students' perceptions regarding the use of Perplexity AI in research gap identification and proposal development. Resulting in categories such as Perceived Benefits, Ethical Concerns, and Critical Thinking Enhancement. Narrative analysis was employed to interpret representative responses that illustrated the sequence of students' experiences in using Perplexity AI from identifying research gaps to developing proposals and addressing ethical challenges. This analytical approach offered both descriptive and interpretive insights, ensuring a balanced understanding of the academic value, challenges, and implications of AI-assisted research in higher education.

4. RESULT AND DISCUSSION

Result

The findings of this study show that students are able to use Perplexity AI effectively to support their academic research, especially in tasks related to identifying research gaps and developing research proposals. Many students reported that Perplexity AI helps them organize the background and problem statement sections more clearly by providing structured explanations and helping them arrange ideas in a logical order. The tool also supports the development of proposal components such as decision tables, research objectives, and hypotheses, which students often find difficult to formulate on their own. Although Perplexity AI offers helpful summaries and suggestions, most students still choose to verify the information with original academic sources, showing that they use the tool responsibly and maintain critical thinking. Overall, these findings indicate that Perplexity AI functions as an

effective supporting tool that improves students' abilities in gap identification and proposal development, while still encouraging them to think carefully about the information they use.

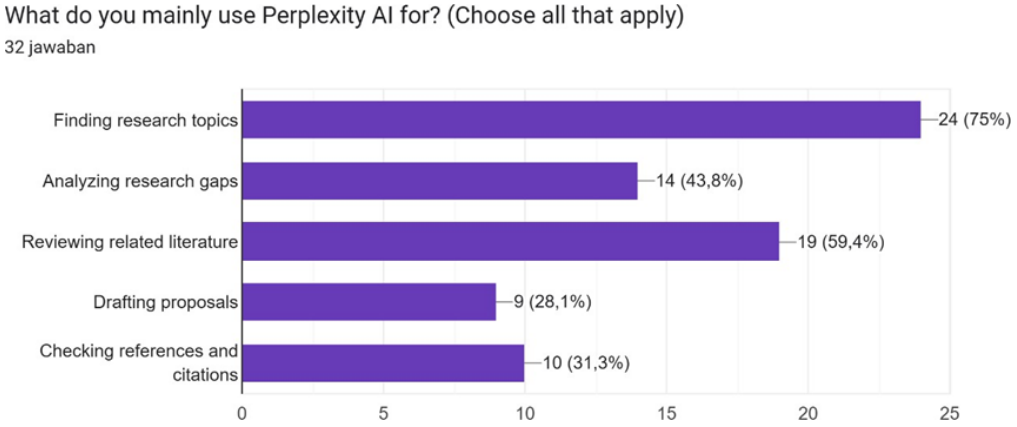

Figure 1. Respondents surveyed.

Of the 32 respondents surveyed about their primary uses of Perplexity AI for academic purposes, the results reveal a clear hierarchy of five main applications. Figure 1 presents several activities where students use Perplexity AI during their research process. A total of 75% of students use Perplexity AI to find or explore research topics, especially when they are still unsure about what issue they want to study. Another 59.4% of respondents use the tool for reviewing related literature, including summarizing previous studies, understanding theoretical concepts, and identifying important ideas from academic sources. In addition, 43.8% of students use Perplexity AI to analyze research gaps, such as recognizing missing issues, underexplored variables, or inconsistencies in the existing literature. Students also use Perplexity AI for tasks such as drafting parts of their proposal, checking references, and checking citation details, although these activities appear with lower percentages. Overall, the percentages in this figure describe the different ways students incorporate Perplexity AI into multiple stages of their research, including finding issues or topics, analyzing research gaps, reviewing related literature, drafting proposal sections, and checking citation information.

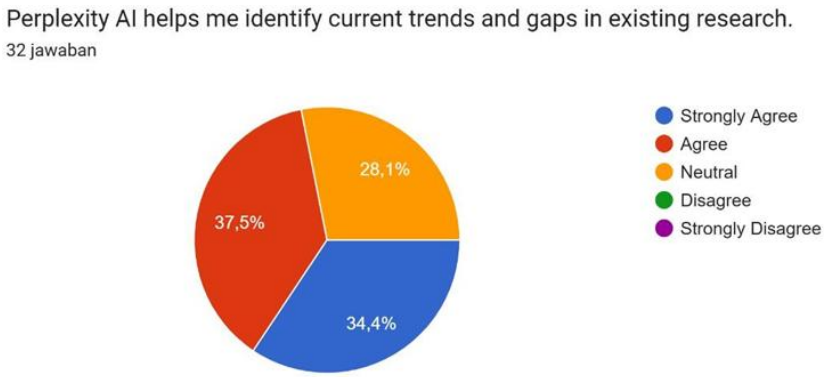

Figure 2. Shows how students responded.

Figure 2 shows how students responded to the statement that Perplexity AI helps them identify current research trends and gaps. According to the data, 65.6% of students selected "agree," meaning they feel that Perplexity AI helps them understand what topics are currently being discussed in their field, what issues are becoming important, and which areas still need more research. Students who chose this option often use the tool to explore research issues, compare studies, monitor developments in the field, and identify research gaps more confidently. The remaining students selected the neutral or disagree options, which means they are either unsure about the tool's ability or prefer to analyze trends and gaps manually. The percentages in this figure relate to how students use Perplexity AI for activities such as finding issues, examining trends, analyzing gaps, and understanding the research landscape. This shows the extent to which students feel supported when using Perplexity AI to scan, explore, or analyze current academic discussions.

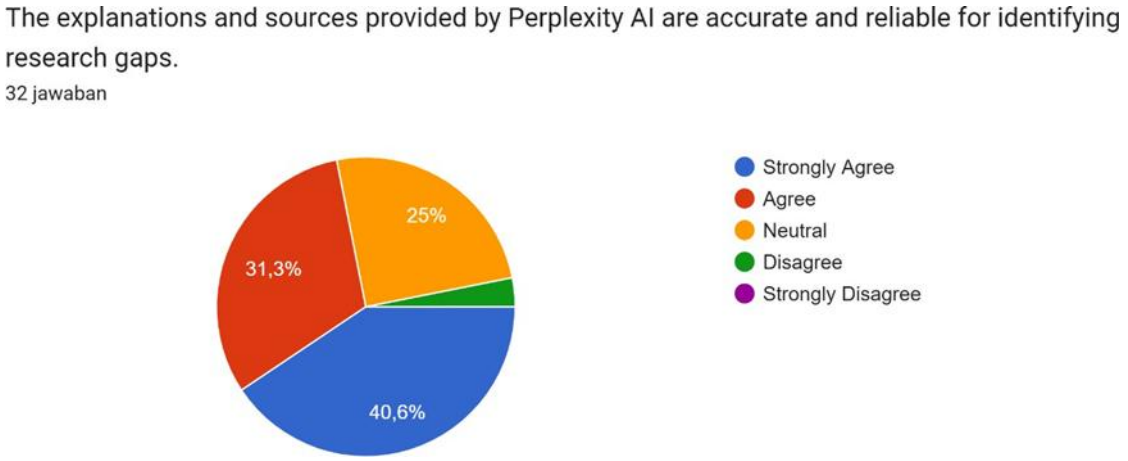

Figure 3. Describes students' perceptions.

Figure 3 describes students' perceptions of the accuracy and reliability of Perplexity AI when assisting them in identifying research gaps. The results show that 56.3% of students agree that Perplexity AI provides explanations and search results that are accurate and reliable for academic purposes, including when they use the tool to analyze research gaps, review related literature, find research issues, or draft proposal sections. Meanwhile, 40.6% chose the "neutral" option, meaning they do not fully trust or fully doubt the accuracy. These students usually continue to verify AI-generated information by comparing it with journal articles, books, and other academic sources. A very small portion selected disagreement. These percentages show how students evaluate the credibility of Perplexity AI while performing research-related activities such as reviewing literature, analyzing research gaps, checking explanations, comparing findings, and looking for academically reliable information.

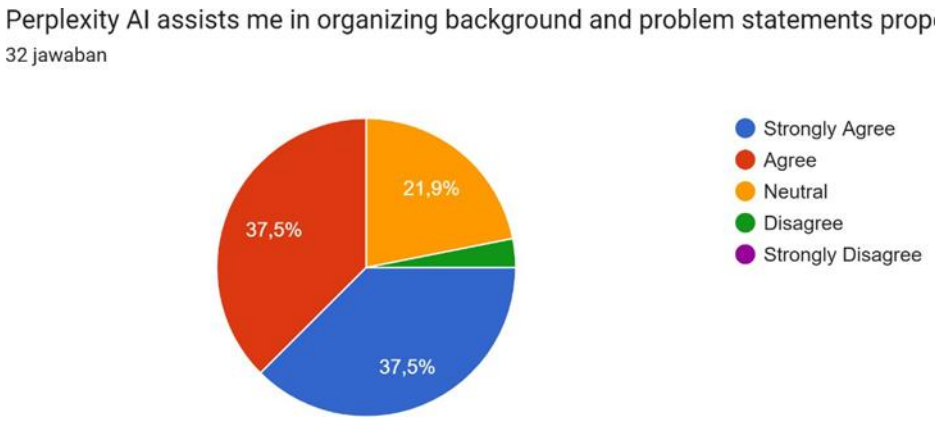

Figure 4. Presents students' responses.

Figure 4 presents students' responses to the statement that Perplexity AI helps them organize the background and problem statement of their research proposal. According to the chart, 59.4% of students agree that Perplexity AI provides useful support when they are writing or organizing these parts of the proposal. Students who selected "agree" often use Perplexity AI to explain research issues, connect ideas from previous studies, summarize related literature, and structure the problem statement more clearly. Some students also use the tool during drafting proposal sections, including background, problem statements, and early research arguments. The remaining students selected neutral or disagree, showing different levels of comfort with using AI in proposal writing. Overall, the percentages in this figure reflect how Perplexity AI assists students in tasks such as organizing the proposal background, identifying the main issue in the study, connecting literature, drafting proposal content, and clarifying the research problem.

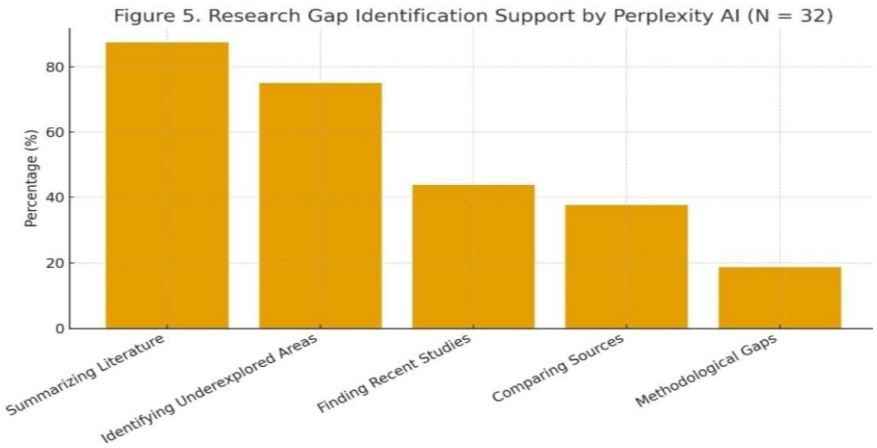

Figure 5. Shows a detailed summary.

Figure 5 shows a detailed summary of how Perplexity AI helps students identify research gaps based on responses from 32 participants. Most students, 87.5%, said that Perplexity AI is helpful because it can quickly summarize many studies, making it easier for

them to understand what has already been discussed in the literature without reading long academic texts. Then, 75% of the participants shared that the tool helps them spot areas that are still underexplored, meaning they can more easily see what topics or issues have not been fully studied. Another 43.75% stated that Perplexity AI supports them by providing access to recent studies and updated information, which helps them ensure that their research stays relevant to current academic developments. Meanwhile, 37.5% of the respondents said that the tool helps them compare multiple sources at once, making it easier to evaluate similarities, differences, and patterns across various studies. Additionally, 18.75% mentioned that Perplexity AI helps them identify methodological problems, such as limited data, unclear research designs, or conflicting findings in previous studies. Overall, the results show that Perplexity AI provides strong support in several aspects of research gap identification, especially in summarizing literature, highlighting missing areas, and offering updated academic information.

Discussion

This study interprets its findings through Sweller's Cognitive Load Theory, which explains how learning effectiveness is influenced by the way information is processed in the human mind. According to this theory, students' performance improves when unnecessary mental effort is reduced and when cognitive resources are directed toward meaningful learning tasks. The results from Figures 1–5 show that Perplexity AI plays an important role in managing students' cognitive load during the stages of research gap identification and proposal development. By helping students access organized information, summarize complex literature, and structure academic arguments, Perplexity AI appears to reduce extraneous cognitive load while simultaneously increasing germane cognitive load that supports deeper understanding and better research performance. Based on this theoretical lens, the following discussion explains how the empirical findings demonstrate Perplexity AI's contribution to students' research processes.

Reduction of Extraneous Cognitive Load in Research Gap Analysis

Identifying research gaps normally requires students to read many articles, compare different findings, and connect ideas across multiple studies. These activities create a high level of extraneous cognitive load, because the mental effort used for searching, scanning, and sorting information does not directly contribute to understanding the core concepts. The findings in Figure 2 and Figure 3 show that Perplexity AI reduces this unnecessary load by providing clear summaries, identifying main themes, and highlighting patterns in the literature. Students no longer need to manually process a large amount of raw text, which helps them

focus more on understanding the essential academic content. This reduced cognitive burden supports the finding in Figure 5, where 80% of respondents reported that Perplexity AI helps them improve their ability to identify research gaps more efficiently and confidently.

Increased Germane Cognitive Load for Proposal Development

Sweller explains that germane cognitive load supports deeper learning because it directs mental effort toward meaningful tasks, such as building new knowledge structures. In the context of proposal development, students need to organize ideas, understand the structure of academic writing, and develop logical arguments. The results in Figure 4 and Figure 5 show that Perplexity AI helps students create clearer background sections, more coherent problem statements, and more organized proposal outlines. By reducing the technical workload such as rearranging information or rewriting unclear ideas Perplexity AI allows students to use their cognitive resources for deeper tasks, including formulating concepts and strengthening academic reasoning. This explains why 85% of respondents felt an improvement in their overall proposal quality after using Perplexity AI.

Cognitive Scaffolding Across the Research Process

Perplexity AI also functions as a tool that provides cognitive scaffolding throughout the entire research workflow. During the topic exploration stage (Figure 1), students receive guidance in identifying possible research directions. During the gap analysis stage (Figures 2 & 3), the tool helps them understand existing discussions by reinforcing key concepts and patterns. During the proposal writing stage (Figure 4), Perplexity AI offers structured guidance that helps students form a logical academic narrative. Because support is provided at every step, students experience a more organized and manageable research process, which aligns with the improvements shown in Figure 5, where multiple aspects of research performance show positive development. This indicates that Perplexity AI not only reduces cognitive burden, but also strengthens learning effectiveness through consistent structural support.

5. CONCLUSION

The findings of this study show that Perplexity AI provides meaningful support for students throughout the stages of academic research, especially in identifying research gaps and developing research proposals. Students report that the tool helps them explore research topics, understand theoretical concepts, and review related literature more efficiently. Perplexity AI also assists in recognizing current research trends, highlighting underexplored areas, and summarizing multiple studies, making the process of gap identification clearer and more manageable. In proposal development, Perplexity AI helps students organize the

background and problem statement sections, connect ideas from previous studies, and structure academic arguments with greater coherence. Although students find the tool helpful and often rely on its explanations, many still verify information using academic sources, showing that they maintain critical thinking and prioritize accuracy. Viewed through Sweller's Cognitive Load Theory, the results indicate that Perplexity AI reduces unnecessary cognitive load by simplifying complex information and streamlining the search and synthesis process. At the same time, it enhances meaningful cognitive engagement by allowing students to focus on deeper reasoning, conceptual development, and the construction of stronger proposal frameworks. This study concludes that Perplexity AI functions as an effective cognitive and analytical aid in academic research. Its benefits are maximized when paired with students' critical evaluation skills, ethical awareness, and proper guidance, ensuring that AI strengthens rather than replaces their intellectual work.

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