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AI as a Learning Partner: Exploring Ethical Awareness of Engineering Students

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Abstract

In recent years, Artificial Intelligence, particularly generative AI tools, has become increasingly integrated into the daily learning experience of engineering students. These tools provide excellent support for coding, designing, and problem-solving activities, like learning facilitators. However, this tendency of using AI raises important ethical questions: Are students fully aware of when and how the use of AI may cross ethical boundaries, such as plagiarism or over-reliance on technology? This study investigates the ethical awareness of undergraduate engineering students regarding the use of AI tools and examines the challenges they encounter in balancing AI assistance with academic integrity. Using a mixed-methods approach, data were collected from 103 undergraduate engineering students and 10 faculty members through surveys and interviews. Quantitative data were analyzed using descriptive statistics and inferential tests, including the Mann-Whitney U test, to examine differences in students' verification behaviors based on their awareness levels, while qualitative data were analyzed thematically. The findings showed that while students find AI helpful, many lack understanding of its ethical boundaries. Teachers emphasize the importance of incorporating ethical awareness-related training and establishing clear guidelines within the curriculum to address existing gaps. This study suggests that with appropriate policies and quality education, AI can be used ethically to enhance learning without compromising academic integrity.

Keywords

Artificial Intelligence, Ethical Awareness, Higher Education, Engineering Students, Policy and Practice

Introduction

In recent years, Artificial Intelligence (AI), especially generative AI tools, has become an integral part of engineering students' learning environments. These technologies provide valuable support in coding, design, and problem-solving tasks, functioning as interactive learning partners that

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enhance efficiency and engagement (Fu & Weng, 2024, Usher & Barak, 2024). By offering personalized feedback and efficient solutions, AI enhances academic performance and engagement, making it a central component of modern engineering education (Usher & Barak, 2024). However, the increasing reliance on AI raises pressing ethical questions. Research shows that many students struggle to define the boundary between appropriate use and misconduct, with concerns such as plagiarism, over-dependence, and reduced critical thinking emerging as key issues (Kong & Zhu, 2025). Moreover, studies reveal inconsistencies in students' awareness of broader ethical issues, including bias, transparency and accountability (Wang et al., 2025). For engineering students, who are future developers of technological systems, these gaps have implications not only for academic honesty but also for responsible professional practice. Given these gaps, educators stress the need for ethical training and clear guidelines within curricula (Tarafdar et al., 2025, Usher & Barak, 2024).

Against this backdrop, this study aims to investigate engineering students' ethical awareness of AI usage, identify the challenges they face in balancing assistance with academic integrity and propose integrating ethical awareness training into engineering curricula.

Methodology

This study used a mixed-methods approach to examine students' awareness, practices, and perceptions regarding the ethical use of AI in academic work. A total of 103 undergraduate students from engineering programs were recruited through convenience sampling to complete a structured survey. The instrument included items on students' frequency and purposes of AI usage, their awareness of risks such as bias and incorrect information, and their ethical perceptions. To enrich these findings, ten university teachers were purposively selected for semi-structured interviews. Interviews explored teachers' perceptions of students' engagement with AI and their awareness of ethical issues. Quantitative data were analyzed using descriptive statistics and inferential tests, including Mann–Whitney U, to examine differences in students' verification behaviors based on their awareness levels. Qualitative data were analyzed thematically, following Braun and Clarke (2012) approach.

Results and Discussion

Figure 1 indicates that AI tools are extensively integrated into students' academic lives, with ChatGPT being overwhelmingly dominant (97.1%). Tools specialized in coding assistance, such as GitHub Copilot, remain less commonly used (11.4%).

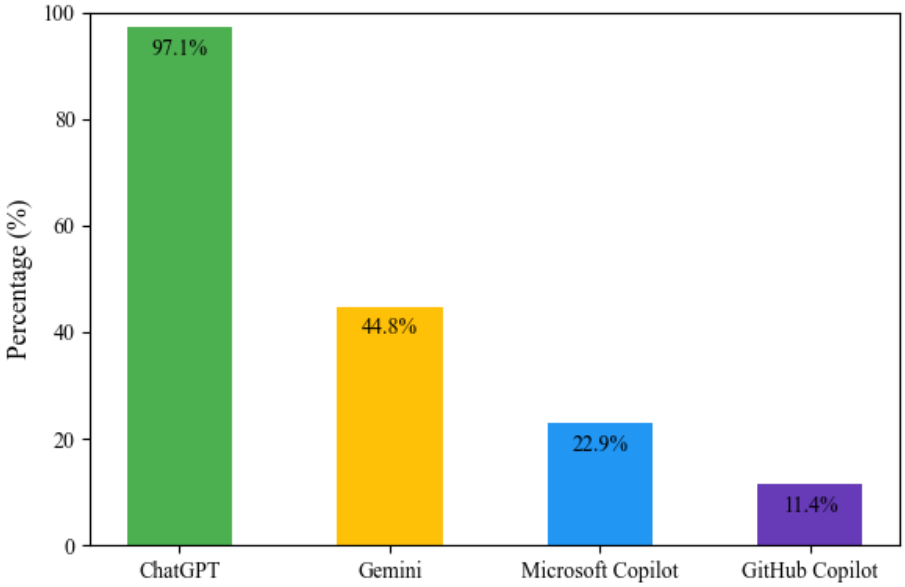

Figure 1. Mostly Used Generative AI Tools

This suggests that students primarily rely on conversational AI for general academic purposes rather than domain-specific tools.

As shown in Figure 2, students mostly utilize AI for problem-solving (70.5%) and assignments (69.5%) purposes. The relatively low use in design (17.1%) implies that AI is perceived more as a text- and logic-based assistant. One student expressed that "*AI helps to find research papers easily and supports building programming logic, which increases speed and reduces workload*."

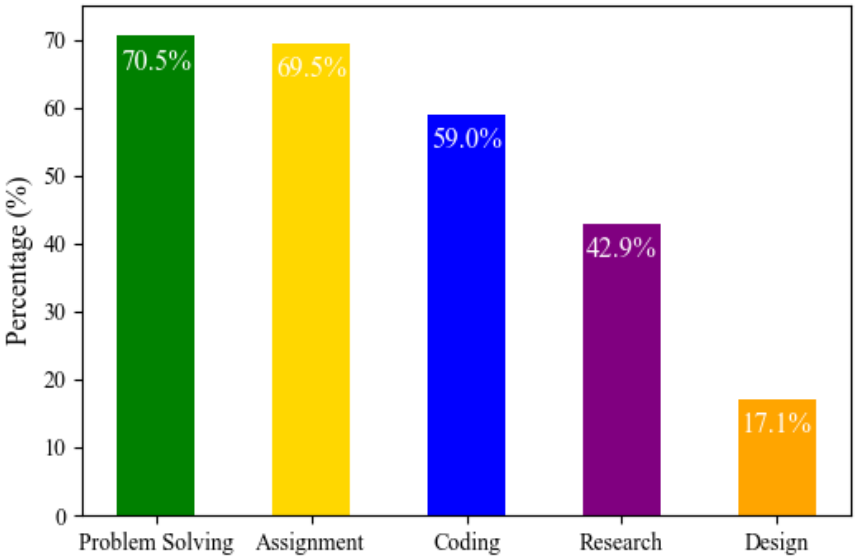

Figure 2. AI Usage for Academic Work

AI dependency reducing critical thinking (see Table 1) received the highest mean score (4.01), indicating that students, on average, agree that relying on AI can negatively affect their critical thinking abilities. One student stated that "*AI dependency reduces critical thinking ability. While completing assignments, AI helps reduce the mental burden*". In contrast, another student stated that "*Completing assignments, solving code or building websites with AI still requires critical engagement*". He argued that students must think carefully about what and how prompts should be given to AI in order to generate better results. Students' responses showed that they are not sure about ethical boundaries (3.48) and widely felt that the university has not provided ethical guidelines (3.45) or awareness training (3.70). The high standard deviation for the statement about university guidelines (1.06) highlights a considerable variability in responses.

Table 1. Descriptive Analysis of Responses

Statement	Mean	Standard Deviation
AI dependency reduces my critical thinking ability	4.01	0.91
I am not sure about ethical boundaries of using AI in academic	3.48	0.79
University did not provide any ethical guidelines of using AI	3.45	1.06
I have not got any ethical awareness training in AI	3.7	0.93

Over 80% (see Table 2) respondents agreed that clear policies on AI use should be established, and willing to receive training on its ethical use. One student mentioned, "*When admitting to the university, students should be informed about clear institutional policies on AI*". One teacher stated, "*Although institutions generally have some policies regarding plagiarism, there are limited guidelines and policies on the ethical use of AI*."

Table 2. Students' suggestions

Statement	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
Institutions should have clear policies on AI use in academics.	25.7%	55.2%	17.1%	0	1.9%
I would welcome training on ethical use of AI	31.4%	49.5%	17.1%	1%	1%

78.41% believed that AI reduces their critical thinking ability (see Figure 3) because of over dependency on AI. One of the teachers explained, "*Most of the assignments are completed on the night before submission deadline*".

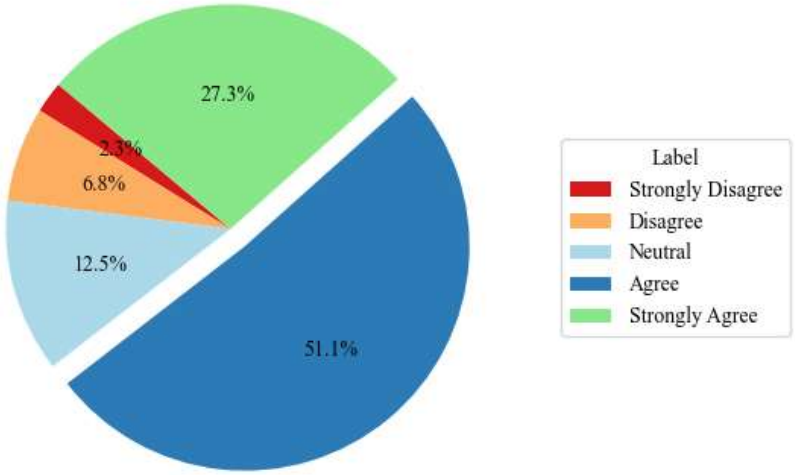

Figure 3. Daily User's Perception on Reducing Critical Thinking capabilities

A Mann–Whitney U test was conducted to examine whether students' awareness of AI incorrect information was associated with their tendency to cross-check AI-generated content before using it in academic work. Participants were asked whether they were aware that AI-generated content can contain incorrect information (Yes/No) and to rate their level of agreement on a 5-point Likert scale with the statement, *"I cross-check AI-generated information before using it in my academic work."*

Results indicated no statistically significant difference in cross-checking behavior between students who were aware of incorrect information (n = 88, Mean Rank = 52.33) and those who were not aware (n = 15, Mean Rank = 50.07), U = 631.00, Z = -0.31, p = .756. This suggests that awareness of potential incorrectness in AI outputs did not lead to greater verification practices (see Table 3).

Table 3. Mann–Whitney U Test for Cross-Checking Behavior by Awareness of AI Incorrect Information

Awareness of Incorrect Info	N	Mean Rank	Sum of Ranks
No	15	50.07	751.00
Yes	88	52.33	4605.00
Total	103		

Note. U = 631.00, Z = -0.31, p = .756.

A second Mann–Whitney U test assessed whether awareness of AI bias was associated with cross-checking behavior. Students who were aware of bias (n = 88, Mean Rank = 52.33) did not significantly differ from those who were not aware (n = 15, Mean Rank = 50.07), U = 631.00, Z = -0.31, p = .756 (see Table 4).

Table 4. Mann–Whitney U Test for Cross-Checking Behavior by Awareness of AI Bias

Awareness of AI Bias	N	Mean Rank	Sum of Ranks
No	15	50.07	751.00
Yes	88	52.33	4605.00
Total	103		

Note. U = 631.00, Z = -0.31, p = .756.

Together, these findings suggest that while most students recognize the possibility of bias and incorrectness in AI outputs, such awareness does not translate into more rigorous verification practices. This highlights a gap between AI literacy and AI ethics in practice. Students appear to hold a surface-level understanding of AI ethics, highlighting the need for a more comprehensive integration of AI ethics and digital literacy into higher education curricula.

Conclusion

The overgrown tendency toward AI dependency for academic work among students raises concern for ethical application. Such reliance may hinder critical thinking skills and decrease the value of personal effort in learning. This study explored that there is a connection between students' ignorance of critical AI usage and ethical concerns. Moreover, a lack of guidelines for ethical AI usage in universities leads to students' overreliance on AI, which also prevents them from exploring its critical usage potential. However, the concerns about AI usage raised in this study can be minimized by developing ethical awareness and clear policy frameworks, which are critical to transforming AI from a potential source of risk into a valuable educational tool.

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