

PAPER

Generative Artificial Intelligence: Ethical Considerations and Its Impact on Students' Cognitive Skills

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ABSTRACT

Generative artificial intelligence (AI) is rapidly transforming higher education, influencing how students learn, produce knowledge, and engage in assessments. This study examines the ethical implications of AI integration in university courses and its perceived impact on students' cognitive skills. Using a mixed-methods secondary data analysis, survey data from 23,218 students across 109 countries and 252 teachers from China, Romania, India, and Brunei were analyzed to explore perceptions of AI capabilities, ethical boundaries, behavioral intentions, and cognitive outcomes. The results have shown that although students are aware of the potential of AI in improving the efficiency and content creation and assistance in the learning process, there are still concerns about overdependence, plagiarism, and lack of critical thinking. The views of faculty underline moral direction and the necessity of systematic assimilation. Developing upon these insights, a theoretical framework is developed that connects antecedent variables, behavior intentions and institutional context to two outcomes the cognitive impact and institutional influence. This framework offers a guide on how universities should introduce generative AI in a responsible manner, and strike a balance between ethical principles and training higher-order cognitive abilities.

KEYWORDS

generative artificial intelligence (AI), cognitive skills, ethical concerns, student competencies

1 INTRODUCTION

The fast uptake of the concept of generative artificial intelligence (AI) in higher education is transforming the way students use learning, assessment, and knowledge production in universities. Large language models, AI-assisted writing systems, intelligent tutoring applications, and other tools are growing more part of the coursework and present new opportunities to improve both efficiency, personalization, and academic support [1], [2]. As these technologies are integrated into the daily routine of

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academic activities, they also bring up significant ethical responsibility issues and the overall impact on the development of cognitive abilities in students [3]. These implications are now an urgent issue to institutions of higher education that are trying to strike a balance between progress and academic integrity and quality of education.

Generative AI is a twofold challenge for universities. On the one hand, it can positively affect learning and help to gain a better understanding, develop ideas, and deal with complicated content [4]. Conversely, its capacity to produce advanced academic materials makes the conventional views on authorship, originality, and individual student work complex. The growing adoption of Generative AI has consequently heightened ethical issues concerning academic integrity, and equity, and transparency, especially in academic assessment settings where the line between support and replacement is not always well-drawn [3], [5], [6]. Such issues are further exacerbated by the lack of standard institutional policies and common perceptions of how AI can be used in various disciplines and programs. Highly connected with these ethical factors is the question of how generative AI impacts the cognitive abilities of students. Critical thinking and independent reasoning as well as problem-solving and effective communication are among the traditional learning outcomes in higher education. As a learning aid which promotes reflection, analysis, and synthesis, generative AI can facilitate these results. Nonetheless, it is also feared that over-dependence or unchecked use of AI technology may undermine the core cognitive functions by decreasing the chance of engaging in independent intellectual work and practice skills [7], [4]. This conflict identifies the necessity of attentive analysis of not only whether students use generative AI, but how and in what circumstances they do it.

The subject of the ethical responsibility of using generative AI is not restricted to individual students, but also to faculty and institutional governance. Teachers are being asked less and less to recreate assessment, learning tasks and instructional designs that reflect the existence of AI, without sacrificing the meaningful cognitive interaction. On the institutional level, universities need to think about the ways the ethical standards, AI literacy programs, and evaluation can be harmonized to make sure that generative AI facilitates learning but does not harm it [2], [8], [3]. Lack of such a congruity will result in the implementation of AI at the expense of cognitive advancement and the subversion of fundamental educational principles.

As such, specific research on the ethical implications of using generative AI in university courses and its perceived effect on the cognitive abilities of students need to be done considering these issues. This paper fulfills this requirement by analyzing the perception of ethical limits, permissible utilization, and cognitive consequences of generative AI in higher education by students and faculty. Locating ethical issues and cognitive performance, the research should contribute to the creation of balanced frameworks that would foster ethical AI use without endangering the intellectual purposes of university education.

2 METHODOLOGY

This study used a mixed-methods secondary data analysis to examine the ethical implications of generative AI and its perceived impact on students' cognitive abilities in higher education, integrating survey data with existing literature. Two datasets were analyzed: the Global Student Survey [9] (N = 23,218, 109 countries) and a teacher survey [6] (N = 252) from China, Romania, India, and Brunei. Variables included performance expectancy, attitudes, behavioral intentions, ethical perceptions, and

cognitive impact, measured on 5-point Likert scales and normalized to a 0–1 range. Descriptive statistics summarized trends, while comparative analysis examined differences across groups and contexts. Regression analysis assessed the influence of attitudes and perceptions on behavioral intentions. Findings were triangulated with prior literature. Limitations include reliance on secondary, self-reported, and cross-sectional data, as well as missing responses and an undergraduate-skewed sample. Nonetheless, the large, cross-national dataset provides meaningful insights into AI use in higher education.

3 LITERATURE REVIEW

3.1 Applications of generative AI in university

Generative AI has taken on a rapid pace of adoption in higher education, and higher education has attracted more scholarly attention to its implications as an educational resource. In a systematic review of empirical research, [2] describe the wide application of generative AI by university students and faculty, with the major reason being perceived efficiency, accessibility, and support in learning. However, there are also significant differences in the responses of institutions, as the review notes that there is no consensus on what is acceptable to be used and inconsistent with ethical guidance. These results imply that although the use of generative AI is becoming established in scholarly practice, it is not integrated properly yet, which brings up questions of governance and education coherence.

3.2 Ethics and governance by the institution

A large portion of the literature is dedicated to the ethical concerns of generative AI. [3] review the existing evidence on the ethics and governance of generative AI in education and suggest transparency, accountability, fairness, and academic integrity as the main principles to adhere to the responsible use of the technology. Their review highlights that the risk of ethical abuse is not only because of the misuse of individuals, but also the institutional failure to create clear policies and monitoring systems.

On the academic practice level, [10] discuss the experience of graduate students in relation to AI-mediated scholarships and report that they are still uncertain about authorship, originality, and disclosure. Although the students were highly aware of ethical issues, they expressed a lack of understanding concerning the institutional expectations, which means that there is a disparity between the policy intent and the academic practice. Collectively, these works underscore the need to have clear ethical guidelines to inform the use of generative AI in higher education.

3.3 Ethical boundaries student perspectives

Studies based on student views demonstrate a conflict between perceived usefulness and ethical ambiguity. [11] examine the attitudes of students towards the introduction or the ban of generative AI and conclude that the majority of students perceive AI as a valid tool of learning and not an ethical abuse. Nevertheless, learners are also vague about correct utilisation in assessment situations, especially where institutional direction is vague.

Likewise, [12] explore student motivation and the limits of what is ethical in the use of AI in education and show that ambiguity in context significantly contributes to ethical decision-making, instead of careful misbehavior. According to their findings, the dependence of students on generative AI can be seen as a sign of practical adjustment to the requirements of academic tasks, and not as a sign of ignoring the issue of academic integrity. These papers show that it is significant to assist the alignment of student practices with the well-defined ethical expectations.

3.4 Faculty views and divergence of stakeholders

Comparative studies demonstrate significant differences in the attitudes of students and the faculty towards generative AI. According to [5], both groups recognize the pedagogical potential of AI, yet faculty members are more worried about the issue of academic integrity, validity of assessment, and ambiguity of authorship. But in comparison with students, their priorities and ethical interpretation are in the way of efficiency and support of learning, which shows a difference in priorities.

[6] continue to pursue these stakeholder dynamics and find areas where there are convergence points, including the necessity of AI literacy, and divergence points, including those who ought to be accountable in using it ethically. They propose in their findings that the integration of AI should be done jointly between institutions, educators, and students instead of enforced by the efforts imposed upon them.

3.5 Generative AI cognitive impact on student learning

In addition to ethical issues, a range of studies discuss the cognitive implications of using the generative AI. [7] offer empirical data that generative AI can indeed facilitate student learning outcomes in case it is applied purposefully in the instructional design. Nevertheless, their results also warn that overreliance or blind trust of AI can decrease active thinking and can lead to diminished critical thinking and ability to solve problems on their own.

[2] observe the same that generative AI is a better cognitive scaffold than an alternative to the learning processes. The sources of information thus indicate that the cognitive outcomes are very dependent on the patterns of usage, the situation of teaching and learning, and the availability of ethical and pedagogical protection.

4 RESULTS

4.1 Global student survey insights

To give a more comprehensive view of students and place the results of the primary dataset into context, the supplementary analysis will be based on a large-scale international survey of perceptions of generative AI tools [9]. The survey included 23,218 higher education students in 109 countries and territories (collected October 2023–February 2024) on the usage, capabilities, regulation, ethical issues, and perceived effects on learning and skills.

The key sociodemographic variables, including gender, age, level of study, field of study, and mode of study, are presented in Table 1, while age-related patterns inferred from the dataset are summarized in Table 2, and additional contextual indicators related to students' academic stage and job confidence are provided in Table 3.

Table 1. Sociodemographic profile of survey respondents (First wave, 2023–2024)

Characteristic	Category	Number (N)	Percentage (%)	Notes/Source
Gender (Q2)	Male	9,346	41.2	Majority female respondents
	Female	13,365	58.8	
	Other/Prefer not to say	(residual)	~0.0	Small/non-reported shares
Level of Study (Q8)	First level (Undergraduate/Bachelor's)	18,935	83.4	Predominantly early-career students
	Second level (Master's/Postgraduate)	2,867	12.6	
	Third level (Doctoral)	912	4.0	
Mode of Study (Q11)	Traditional (classroom)	10,754	47.3	
	Blended (hybrid)	9,833	43.2	
	Online	2,159	9.5	
Student Status (Q7)	Full-time	19,409	85.3	(From related Slovenian subsample trends, consistent globally)
	Part-time	3,354	14.7	
Institution Funding (Q6)	Public/government funded	(majority)	~High	Not precisely quantified in aggregates, but dominant
Total Sample	–	23,218	100	From 109 countries/territories

Notes: Percentages may not sum exactly to 100% due to missing/incomplete responses on some items (common in large voluntary surveys). Data from [9], based on the Global ChatGPT Student Survey (first wave).

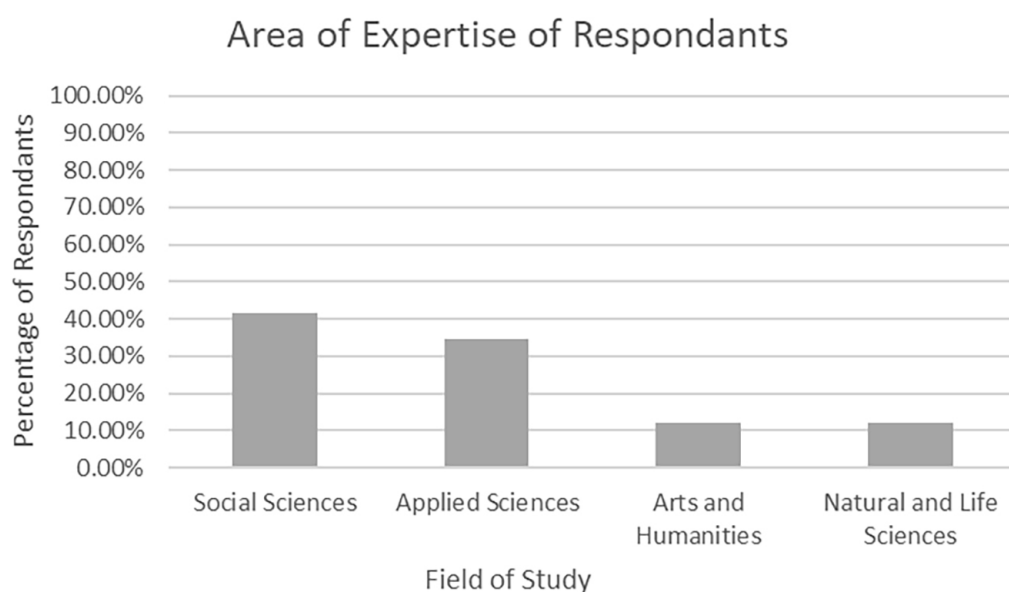
**Fig. 1.** Area of expertise of respondents

Table 2. Age distribution insights (Inferred from Q3 and sample trends)

Age Group (Years)	Approximate Share	Interpretation
18–24	~70–80%+	Dominant group; modal age early 20s, reflecting undergraduate skew
25–29	~10–20%	Common among master's students
30+	<10%	Limited; doctoral students and mature learners underrepresented
Mean age (approx.)	~22–24	Heavily youth-oriented sample

Notes: Exact age brackets are not published in aggregates, but the level-of-study distribution (83.4% undergraduate) and global higher education norms indicate strong concentration among younger adults. No detailed histogram available in primary publication; inferred from sample profile.

Table 3. Additional contextual indicators (Selected from Q9, Q12)

Item	Category	Percentage (%)	Notes
First-year Bachelor's (Q9)	Yes	(Substantial)	Many undergraduates in early stages; exact % not detailed but aligns with level skew
Job Confidence after Studies (Q12)	Extremely/Very confident	Moderate–high	Varies by region/field; not quantified precisely in main aggregates
	Moderately confident	–	Common mid-range response
	Slightly/Not at all confident	Lower	Potential link to perceived AI value for employability

Table 4 shows normalized descriptive statistics (0–1 scale, $(M-1)/4$) of selected key constructs (5-point Likert items). According to the respondents, there was a high level of agreement on the ability of generative AI to perform simple tasks (e.g., natural language understanding, efficient information delivery, summarization), and normalized means tended to be above 0.70. Blended/online learning facilitation was also moderately-highly endorsed. Nonetheless, the perception was less optimistic to be reliable and supportive to the traditional classroom learning.

Ethical issues were moderately agreed especially in terms of risks of promoting cheating/plagiarism, sharing false information, inhibiting independent learning, and decreasing human interaction—normalized means of 0.50–0.65. The respondents were very supportive of international, governmental, university, and employer regulation (means 0.70 normalized). On cognitive effects (measured through perceived skill improvement), generative AI was perceived positively on efficiency, content creation, and AI literacy and less positively on critical thinking, decision-making, numeracy, and interpersonal skills—indicating that there is awareness of the risk of overreliance that may lead to higher-order cognitive decline.

These international trends are consistent with the moderate-to-high performance expectancy (0.68) and motivation (0.58) of the main dataset and enhance ethical ambiguities (global concerns greater than local attitudes/perceptions at 0.56) and cognitive trade-offs. This supports the necessity of ethical protection against impaired autonomous thinking.

Table 4. Normalized descriptive statistics from global student survey (Selected constructs, 0–1 scale)

Construct/Key Items (Selected)	Normalized Mean (M)	Interpretation (Original 1–5 Scale Equivalent)
Capabilities: Understand/respond in human language (Q19a–b)	~0.75–0.80	High agreement (~4.0–4.2/5)
Capabilities: Summarize/simplify information (Q19f–g)	~0.70–0.75	Moderate-high (~3.8–4.0/5)
Capabilities: Facilitate blended/online learning (Q19i–j)	~0.65–0.70	Moderate (~3.6–3.8/5)
Ethical Concerns: Encourage cheating/plagiarism (Q22b–c)	~0.55–0.65	Moderate agreement (~3.2–3.6/5)
Ethical Concerns: Hinder learning/do work for students (Q22j)	~0.60	Moderate (~3.4/5)
Ethical Concerns: Mislead with inaccurate info (Q22e)	~0.60–0.65	Moderate (~3.4–3.6/5)
Support for Regulation (International/Government/University) (Q21a–c)	~0.70–0.80	High (~3.8–4.2/5)
Perceived Skill Enhancement: Critical thinking/decision-making	~0.50–0.60	Lower (~3.0–3.4/5)

Note: Normalization $(M - 1)/4$ used with 5-point Likert scales (1 = Strongly Disagree, 5 = Strongly Agree). Approximated from the published descriptives and trends in [9]; item-specific details are in the supporting information. N = 23,218. There were no standard deviations and scale-level Cronbach reported in primary publication.

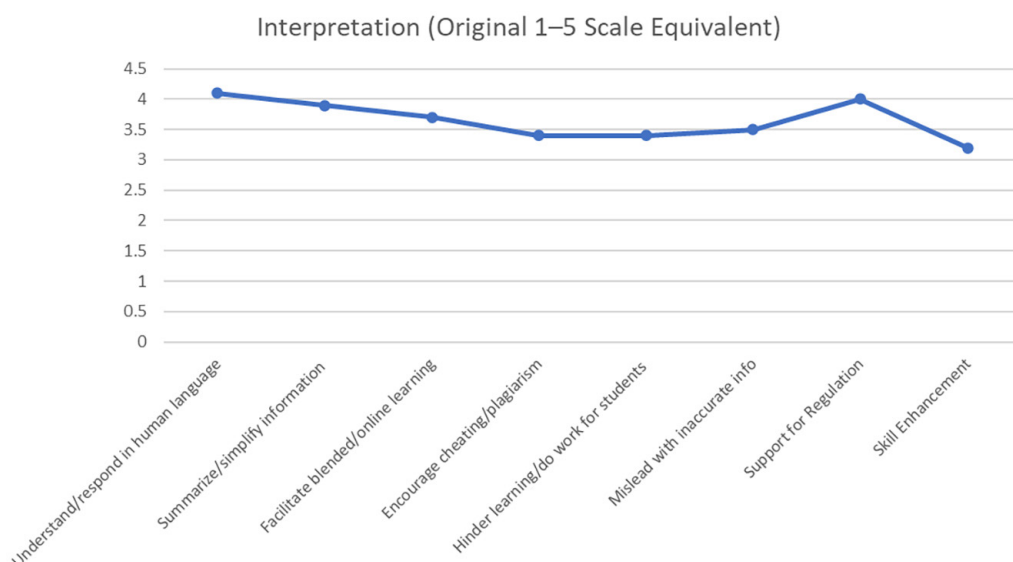
**Fig. 2.** Attitudes toward AI capabilities, ethical issues, regulation, and skills improvement

Figure 2 shows the perception of respondents regarding the potential of AI, ethical issues, regulatory backing, and skill training. AI is scored high in language understanding (~4.0–4.2/5) and information summarization (~3.8–4.0/5) and has an average score in the facilitation of online learning (~3.6–3.8/5). There is moderate agreement on ethical issues such as cheating, impeding learning or misinformation (~3.2–3.6/5). The level of support regarding international, governmental, and

university regulation is high (~3.8–4.2/5) whereas the perceived increase in critical thinking and decision-making abilities is less (~3.0–3.4/5).

4.2 Teacher dataset results (Four-country survey on learning with AI, July 2024)

The analysis of 252 teachers across China, Romania, India, and Brunei shows that most respondents were mid-career professionals ($M = 19.7$ years of teaching experience). Figure 3a illustrates the **country distribution**: the majority of respondents were from China (35.3%), followed by Romania (27.0%), India (23.0%), and Brunei (14.7%). China contributed the largest proportion of teachers, while Brunei represented the smallest share, providing context for interpreting cross-country variations in AI knowledge, adoption, and usage. Gender distribution is presented in Figure 3b. Most teachers were female (81.7%), with male respondents comprising 16.7%, and a small fraction (1.6%) preferring not to disclose their gender or missing responses. This clear female majority reflects global trends in teaching, particularly in primary and secondary education, and contextualizes perspectives on AI integration. Internet access among respondents is shown in Figure 3c. A total of 38.9% of teachers reported very high or high connectivity, 19.0% reported moderate access, and 5.6% reported low or very low access, with 36.5% of responses missing. Overall, most teachers had adequate internet access, which is critical for effective engagement with AI tools.

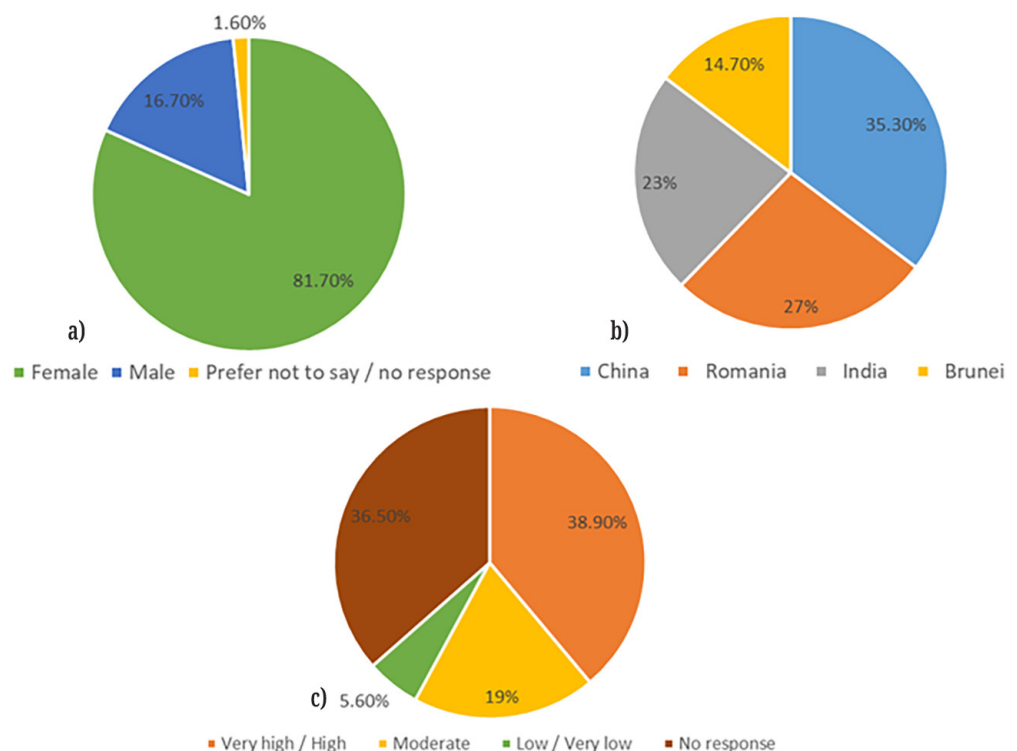


Fig. 3. Sociodemographic profile of teacher survey respondents (Four-country AI survey, July 2024): (a) Countries of teachers, (b) Gender of respondents, and (c) Internet access

Table 5 is a summary of Teacher's knowledge, Adoption, and experience. Teachers' **knowledge of AI tools** was primarily moderate (29.0%) or low (25.0%), with only

9.5% reporting high or very high expertise and 36.5% providing no response, highlighting a notable gap in AI readiness. Regarding **AI adoption**, 53.2% of teachers reported using AI tools in their teaching, compared with 45.6% who did not, with a small fraction of missing responses (1.2%). **Usage frequency** indicates that AI is not yet deeply integrated into daily practice: 53 teachers used AI weekly, 47 occasionally or monthly, 16 multiple times per week, and 21 daily or every class.

Participation in **formal AI training** was limited, with most teachers relying on informal learning, such as webinars or short courses. Despite these constraints, AI tools were generally perceived as somewhat effective to effective, with commonly used platforms including ChatGPT, Canva, Kahoot!, and Google Classroom. Overall, these findings underscore a gap between awareness and effective implementation and emphasize the need for structured training and institutional support.

Table 5. Artificial intelligence knowledge, adoption, and teaching experience among teacher respondents (July 2024)

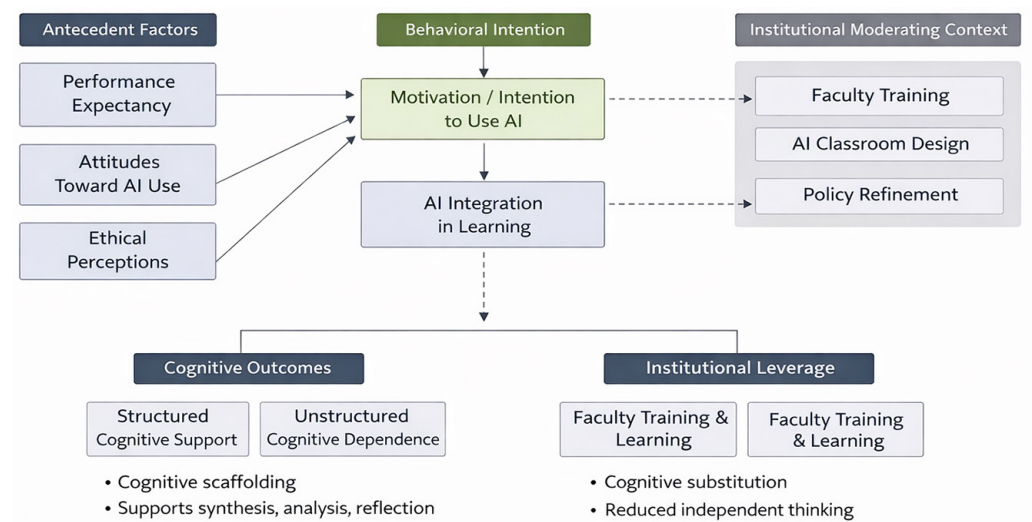
Characteristic	Category	Number (N)	Percentage (%)
Knowledge of AI Tools	Moderate	73	29.0
	Low/Very low	63	25.0
	High/Very high	24	9.5
	No response	92	36.5
AI Adoption in Teaching	Yes	134	53.2
	No	115	45.6
	No response	3	1.2
AI Usage Frequency	Once a week	53	–
	Rarely/Monthly	47	–
	Multiple times/week	16	–
	Daily/Every class	21	~8
	No response	92	36.5
AI Training Participation	Yes	(minority)	–
	No/N/A	(majority)	–
Institution Funding	Public/Government-funded	(majority)	~High
Perceived Effectiveness of AI	Somewhat effective/Effective	(majority)	–

Table is a summary of the teaching experience of the sample. There is an overwhelming skew towards the middle-level educators; most of the respondents are in the age group of 16–30 years. Teachers with fewer than 1–5 years in their early years and those with many years in their highly experienced group (30+ years) are underrepresented. The median (20 years) and the mean (19.7 years) also indicate that the sample is composed mainly of mid-career professionals, which implies that the given results are mostly related to the views on experienced teachers.

Table 6. Teaching experience reflections

Experience Range (Years)	Approximate Share	Interpretation
1–5	Low	Early-career teachers underrepresented
6–15	Moderate	Mid-level experience present
16–30	High	Dominant group
30+	Low	Few highly senior respondents
Mean experience	19.7 years	Strongly mid-career sample
Median experience	20 years	Consistent with distribution

5 FRAMEWORK OF GENERATIVE AI INTEGRATION IN HIGHER EDUCATION

**Fig. 4.** Framework of generative AI integration in higher education

The framework presented in Figure 4 illustrates how the integration of generative AI in higher education is shaped by a set of interacting factors that influence both student learning and institutional outcomes. The model is structured around three core elements: **Antecedent Factors**, **Behavioral Intention and AI Use**, and **Institutional Context**, which collectively lead to two outcomes: **Cognitive Impact and Institutional Influence**. The framework highlights that AI adoption in education is not solely determined by the availability of technology, but by students' perceptions, their patterns of use, and the guidance provided by educational institutions.

5.1 Antecedent factors

Antecedent factors represent the initial circumstances and perceptions that influence students' motivation and willingness to use generative AI technologies. These include students' expectations regarding what AI can accomplish, their personal

attitudes toward technological tools, and their ethical views about the appropriate use of AI in academic work. When students perceive AI as useful and acceptable within academic norms, they are more likely to adopt it as part of their learning activities. Collectively, these factors shape the context in which students decide whether and how to engage with generative artificial intelligence.

5.2 Behavioral intention and AI use

Behavioral intention refers to students' willingness to incorporate AI tools into their studies. This intention translates into actual patterns of AI use during academic activities. Some students may use AI strategically to support idea generation, understanding of complex concepts, and problem-solving. However, the framework also acknowledges the possibility of excessive dependence, where students rely heavily on AI to complete tasks without actively engaging in the learning process. As a result, the framework emphasizes that the **manner in which AI is used**, rather than simply its presence, plays a significant role in shaping learning outcomes.

5.3 Institutional context

The institutional context represents the role of universities and faculty in shaping how AI technologies are adopted and used within academic environments. Colleges and professors act as guiding influences through faculty support, institutional policies, and the integration of AI tools into coursework. These mechanisms help ensure that AI is used responsibly while maintaining academic integrity. Institutional guidance can therefore strengthen the positive effects of AI on student learning while reducing the risks associated with excessive reliance on AI technologies.

5.4 Cognitive and institutional outcomes

The interaction of these elements leads to two primary outcomes. At the **cognitive level**, responsible and guided AI use can enhance knowledge acquisition, creativity, critical thinking, and problem-solving abilities. However, unregulated or excessive reliance on AI may reduce student engagement and limit the development of independent learning skills. At the **institutional level**, effective policies, training initiatives, and curriculum design can support ethical AI use while maintaining academic integrity. These efforts enable institutions to integrate AI technologies in a balanced and sustainable manner.

As illustrated in Figure 4, the framework presents generative AI integration as a process in which students' perceptions and motivations influence their intention to use AI, which then shapes the ways in which these technologies are applied in learning activities. The institutional context acts as a moderating layer that guides responsible use through policies, faculty support, and structured implementation within coursework. Through the interaction of these components, the framework explains how generative AI can influence both students' cognitive development and broader institutional practices in higher education.

6 RESEARCH GAP

Despite growing attention to generative AI in higher education, several gaps remain in the current literature. First, most studies focus on either student adoption or ethical considerations in isolation, with limited research linking students' behavioral intentions, ethical awareness, and cognitive outcomes within a cohesive framework. Second, existing evidence is often localized, with a scarcity of cross-national studies that account for cultural, institutional, and technological differences in AI adoption and perceptions of ethical use. Third, while student perspectives are widely examined, fewer studies consider the moderating role of faculty guidance and institutional policies in shaping responsible AI use and learning outcomes. Fourth, empirical data on the effects of generative AI on higher-order cognitive skills—such as critical thinking, problem-solving, and decision-making—remain limited, particularly in large-scale and cross-disciplinary contexts. Finally, there is a lack of integrative frameworks that capture the interplay among antecedent factors, behavioral intentions, institutional context, and dual outcomes, including cognitive development and institutional influence. Addressing these gaps is essential for developing structured, ethically responsible, and pedagogically effective strategies for integrating generative AI in higher education.

7 DISCUSSION

The results demonstrate that there is a dual impact of generative AI in higher education. Students are confident that AI can help them create, summarize, and otherwise support their learning content, but acknowledge that it is associated with moderate threats to academic integrity and higher-order thinking [13], [11]. Faculty issues revolve around ethical advice, authorship and inconsistent institutional regulations indicating lack of cohesion between students' adoption process and educational regulation [14], [6].

The framework proposed demonstrates that the effects of AI do not only rely on its use, but the interplay between the attitude towards AI, ethical consciousness, and institutional background regarding the student. The AI literacy programs could be used to improve the learning outcomes and reduce the threats of overreliance and cognitive underdevelopment through structured policies, faculty guidance, and AI literacy programs. Access and attitudes differ cross-nationally, indicating that the strategies of AI integration must be local. In general, responsible implementation involves balancing efficiency, ethical standards, and cognitive development by coordinated actions of students, faculty, and institutions [8].

8 CONCLUSION

Generative AI is transforming higher education by enhancing learning, efficiency, and personalized academic support, while also raising ethical and cognitive concerns. This study demonstrates that the impact of AI on student learning is shaped not only by its adoption but also by the interaction of student attitudes, ethical awareness, and institutional guidance, as illustrated in the proposed framework. The framework highlights how antecedent factors, behavioral intentions, and institutional context jointly influence cognitive outcomes and institutional effectiveness. Findings indicate that structured faculty guidance, clear ethical policies, and AI literacy programs are critical to mitigate overreliance and ensure that AI acts as a cognitive scaffold rather than a substitute for independent thinking.

Moreover, the framework underscores the importance of contextual adaptation across cultural and institutional settings. Overall, effective and responsible integration of generative AI requires coordinated efforts among students, faculty, and universities to balance ethical standards, cognitive development, and sustainable educational practices.

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