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Original Article

A study on the perception of Generative AI in higher education students and teachers

Un estudio sobre la percepción de la IA generativa entre estudiantes y profesores de educación superior

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Abstract

Introduction: generative Artificial Intelligence (GAI) represents a disruptive technological advancement that is profoundly transforming higher education worldwide. In response, several organizations, including UNESCO, have developed guidelines promoting the responsible integration of AI in educational and research contexts, emphasizing its supportive and human-centered role.
Objectives: this study aimed to analyze the perception of generative AI in higher education by examining the frequency of use, perceptions of its future impact, and awareness of ethical and privacy risks.
Methodology: data were collected through instruments administered to faculty members and undergraduate students at the University of Córdoba, Colombia. This dual perspective allowed comparison between academic and student viewpoints, contributing to the growing discussion on the role of GAI in higher education and research.
Results: findings reveal that the adoption of GAI is increasingly widespread among both faculty and students, though notable differences persist in their usage patterns and approaches to risk management. Students show high familiarity and frequent use, while faculty members adopt GAI more cautiously, reflecting deliberate integration into pedagogical practices.
Conclusions: despite its growing prevalence, significant gaps remain in understanding the ethical and privacy implications of GAI. These findings underscore the need for targeted training and institutional guidance to promote responsible and effective use of generative AI in higher education.

Keywords: Generative AI, Higher Education, Ethics and Privacy.

Resumen

Introducción: la Inteligencia Artificial Generativa (IAG) representa un avance tecnológico disruptivo que está transformando profundamente la educación superior a nivel mundial. En respuesta a este cambio, diversas organizaciones, entre ellas la UNESCO, han desarrollado directrices para promover la integración responsable de la IA en los contextos educativos y de investigación, destacando su papel como herramienta de apoyo y su orientación hacia interacciones centradas en el ser humano.
Objetivos: el objetivo de este estudio fue analizar la percepción sobre la inteligencia artificial generativa en la educación superior, considerando dimensiones como la frecuencia de uso de las herramientas de IAG, las percepciones sobre su impacto futuro y la conciencia respecto a los riesgos éticos y de privacidad.
Metodología: los instrumentos se aplicaron a docentes y estudiantes de pregrado de la Universidad de Córdoba, Colombia, con el fin de ofrecer una perspectiva dual que integrara las visiones académica y estudiantil, y contribuir así a la discusión emergente sobre este tema en la educación superior y la investigación.
Resultados: los resultados revelan que la adopción de la IAG es cada vez más amplia entre docentes y estudiantes, aunque persisten diferencias notables en sus patrones de uso y en la gestión de los riesgos asociados. Los estudiantes muestran altos niveles de familiaridad y uso frecuente, mientras que los docentes presentan una adopción más cautelosa e intencionada en sus prácticas pedagógicas.
Conclusiones: a pesar de su creciente presencia, se identificaron brechas significativas en la comprensión de las implicaciones éticas y de privacidad de la IAG, lo que resalta la necesidad de formación específica y de orientación institucional para garantizar su uso responsable y efectivo en la educación superior.

Palabras clave: Inteligencia artificial generativa, educación superior, ética y privacidad.

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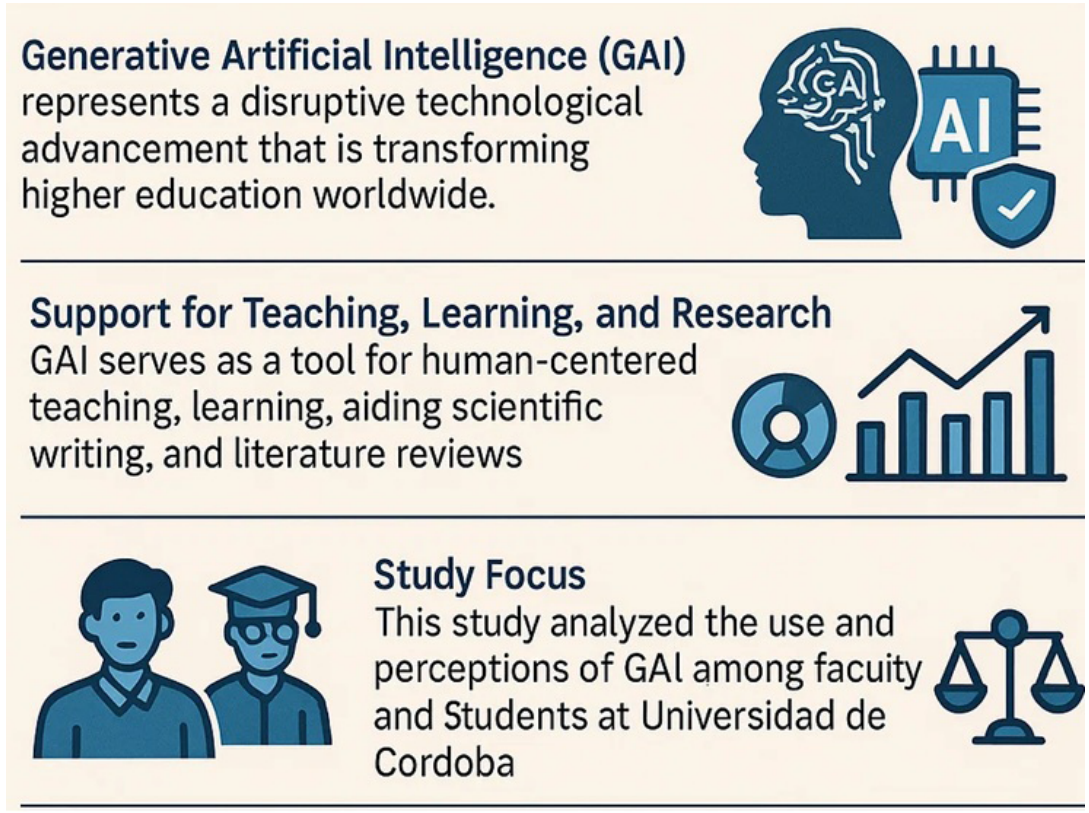
Spanish version

Why was it conducted?
To empirically analyze how undergraduate students and faculty at the University of Córdoba perceive and use generative AI, examining the frequency of use, perceived future impact, and awareness of ethical/privacy risks to provide a comparative, contextualized view for institutional action (survey period: March 1–May 29, 2025; n=576 students, n=88 faculty).

Most relevant results:
Adoption is widespread but uneven: students show high familiarity and frequent use (>90% interacted with tools; ~56% use several times a month), while faculty are more cautious (≈41% use once/twice a month, 28% weekly). Significant gaps exist in understanding ethical/privacy issues; students strongly request formal training, and both groups call for clear institutional policies.

What these results contribute:
The study provides empirical, comparative evidence from a Latin American university, highlighting concrete needs (teacher training, curricular integration, privacy/ethics policies, and infrastructure) and offering an operational 12-month action plan to guide responsible, pedagogical adoption of generative AI.



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Introduction

Generative Artificial Intelligence (GAI) represents a disruptive technological innovation that is profoundly transforming higher education worldwide. In response to this shift, various international organizations, including (1), have developed guidelines to promote responsible implementation in education and research. These frameworks emphasize the role of GAI as a tool that supports learning processes while preserving the centrality of human interaction. From a research standpoint, GAI has been recognized as a valuable resource for assisting in scientific writing, facilitating literature reviews, and supporting broader stages of the scientific method. However, these same guidelines also warn of the potential challenges associated with their use, particularly in relation to data privacy, ethical controversies, algorithmic bias, and lack of model transparency. Consequently, they proposed a set of regulatory and methodological principles founded on a human-centered approach that prioritizes human oversight, fairness, and accountability.

Similarly, the Organization of Ibero-American States (OEI), with the contributions of (2), presents a comprehensive perspective on GAI in the educational context, addressing key ethical, pedagogical, labor, and environmental dilemmas associated with the use of emerging technologies. This perspective underscores the relevance of GAI at all educational levels, from basic to higher education. For teachers, these tools provide significant advantages by reducing the time required to design instructional materials, create assessments, and evaluate students' work. For students, GAI offers opportunities to clarify concepts, explore topics in greater depth, develop projects, and receive immediate feedback, thereby enhancing personalized learning and promoting engagement in the educational process.

Beyond the academic domain, GAI has influenced productivity and efficiency across diverse sectors, including software development, manufacturing, and education. Studies such as (3), (4), and (5) have documented its growing role in reshaping professional practices, while research by (6)–(10) demonstrates how generative AI is increasingly used in educational settings to create content, deepen conceptual understanding, automate assessments, provide adaptive feedback, support scientific writing and facilitate information retrieval. The daily use of Generative Artificial Intelligence in Education (GAIE) has shown sustained and transformative growth, highlighting its potential as a catalyst for innovation in teaching and learning. Nonetheless, persistent concerns remain within the academic community regarding its implementation, particularly in relation to academic integrity, assessment validity, data protection, and the absence of institutional standards to guide its ethical use. Moreover, there is still limited training for faculty and students to fully understand the opportunities and challenges that accompany these technologies.

This study aimed to analyze the perceptions of generative AI in higher education. Specifically, it examines the extent of its use, perceived future impact, and ethical and privacy risks associated with its adoption. The study was conducted among faculty and undergraduate students at the University de Córdoba, Colombia, to contribute to the ongoing academic discussion surrounding the integration of generative AI into teaching and research practices in higher education.

This paper is organized as follows: section 2 reviews the related literature; section 3 presents the materials and methods; section 4 details the main results; section 5 provides the discussion; section 6 conclusions; and section 7 outlines the operational recommendations derived from the study.

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Related Works

(11) and (12) showed that universities are adopting regulations for the appropriate use of GAI in the academic context. In the first study, special attention was paid to teaching and learning, to guide students and teachers in ethical and productive use; for this, they consulted the perception of the use of these tools in curricular activities, in writing, in reflections on teaching and ethical use. The second study showed that higher education institutions are looking for the need to establish a framework of ethical regulations for the use of GAI in the academic context, based on studies by UNESCO and OECD, so that there is full awareness of moral and legal responsibility as well as the need for human supervision and transparency in the use of these tools. While institutions adopt flexible approaches, they must provide strategies for efficient and transparent integration of GAI so that students and teachers know their applicability and limitations.

Studies are being conducted on AI and the forms of integration used by teachers in academic practice, that is, in academic writing, lesson planning, assessments, and concerns about the academic integrity of AI in the classroom, especially through the use of ChatGPT, as mentioned in the study by (13). Other research has sought to understand how teachers perceive and react to these tools and new AI strategies in their educational practice, how they face this new reality, and how they assume the challenges this implies. Indeed, there were differences in the perceptions. Some teachers were resistant to the use of AI chatbots. However, there are concerns regarding academic integrity, plagiarism, and copyright. From a pedagogical perspective, it is necessary to understand how these types of AI tools are used in an educational context, as mentioned in the study by (14).

GAI is used in the classroom context to support personalized learning experiences to empower students' self-regulation of learning, as mentioned in the study by (15), through the adaptation of content, the use of interactive environments, and immediate feedback tools to address student concerns and promote active participation in the learning process. Despite the opportunities that GAI offers in academic experience, allowing for improved academic performance and contributing to efficiency and productivity in the development of academic work because of the versatility of these emerging technologies, concerns persist regarding ethics, trust, and the need for competency-based human oversight in the community of students and teachers to raise awareness of the role played by these emerging technologies, as stated in (16).

The integration of GAI into higher education is growing, as noted by (17). However, there is a persistent lack of clear regulatory frameworks for academic integrity, data privacy, and equitable access to GLI tools. This is coupled with a lack of training for teachers and students in ethical and moral aspects, pedagogical and didactic aspects of GAI, generation of educational content, support for learning analytics, and automated assessments.

GAI is used to improve communication skills and support students' self-regulated learning through innovative strategies, as indicated by (15), which uses several categories of tools: writing-oriented (Grammarly and Jasper), image processing (MidJourney and Adobe Firefly), and video processing (OceanEngine) to improve students' communication skills. Although the study shows important findings, it emphasizes that longitudinal studies are required to verify the results broadly and in

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depth. They were also aware that the study was conducted in a specific context and did not validate cultural diversity in general, which could be a significant limitation.

(18) focused on the integration of the GAI using Chatgpt to investigate how these tools affect the validity of the assessments, in which efficiency is observed in the tools, but human supervision is required, because in some cases there may be inaccuracies. Now, the effects on teaching and learning from the perspective of the relationship with Bloom's Taxonomy at the lower levels, that is, this type of tool can be useful to remember and understand; however, at the highest levels, in what has to do with creation, little effectiveness is evident. In addition, this study calls for ethics, creativity, and critical thinking in the integration of GAI in the educational context.

(19) This study comprehensively examines the impact of generative artificial intelligence (GenAI) on higher education, highlighting its transformative potential and the challenges it entails. One of its main contributions is the critical analysis of the role of Gen AI in redesigning assessment practices, showing how it can foster personalized learning, immediate feedback, and administrative efficiency. Simultaneously, the authors underline the risks associated with academic integrity, the authenticity of student work, and the possibility of overreliance on these tools. The study also provides a conceptual framework by linking Gen AI with pedagogical theories such as social constructivism, personalized learning, and competency-based learning, highlighting the need for technology to complement, not replace, teaching. Another central contribution is the identification of ethical and social implications, including data biases, environmental impact, privacy, and the digital divide, which could deepen existing inequalities in the field. Finally, the authors propose practical guidelines for higher education institutions, such as GenAI literacy programs, assessment designs that foster critical thinking and creativity, and transparent policies that promote the responsible, equitable, and ethical use of these technologies.

(7) This study critically analyzes the ethical dilemmas posed by the incorporation of generative chatbots, such as ChatGPT, in higher education. Among its main contributions is the identification of five key problem areas: data privacy, algorithmic bias, student self-efficacy, plagiarism, and AI-generated hallucinations. Regarding privacy, it emphasizes that the use of chatbots involves the collection of sensitive information from students, which generates tensions with regulations such as the GDPR and raises difficulties regarding the right to be forgotten. Regarding algorithmic bias, this study shows how systems trained with historical data can reproduce and amplify social inequalities, affecting educational equity. Regarding self-efficacy, the study warns that an overreliance on chatbots could diminish students' autonomy and critical thinking, although it also recognizes their potential to support self-directed learning. Plagiarism is a central challenge, highlighting the need for new forms of assessment that reduce the temptation to present AI-generated texts as one's own. Finally, the phenomenon of AI hallucinations is analyzed, highlighting the risk of spreading inaccurate or fabricated information. The author concluded that the integration of chatbots must be accompanied by clear policies, transparency mechanisms, and innovative pedagogical approaches that maximize the benefits of AI without compromising academic integrity.

(20) It presents one of the first systematic empirical studies on the adoption of generative artificial intelligence (GAI) in higher education, providing concrete evidence of how students and faculty perceive, use, and value these technologies. Its main contribution lies in offering representative

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data from a broad survey, which allows for the identification of both usage patterns and emerging concerns. Regarding the benefits, the study revealed that GAI is seen as a support for academic productivity, writing assistance, and idea generation, which enhances autonomous learning and research efficiency. Its capacity to democratize access to resources is also highlighted, especially among students with less institutional support. However, significant risks have been identified. These include possible overdependence on these tools, a decrease in critical thinking, a lack of critical digital literacy, and ethical dilemmas linked to plagiarism, originality, and academic authorship. Finally, this study contributes to the academic debate by proposing that universities should not only regulate the use of IAG, but also integrate it into their pedagogical strategies, accompanied by training in digital ethics and clear institutional policies that balance innovation with academic integrity.

Table 1 presents a comparative table of different studies related to generative artificial intelligence (GAI) in higher education.

Table 1. Distribution of population size and sample of students. Recent studies on generative artificial intelligence (GAI) in higher education.

Study	Objectives	Main findings	Limitations	Implications
(11)	Analyze institutional regulations on the use of GAI in teaching and learning.	Universities develop ethical and pedagogical guidelines, consulting faculty and students' perceptions.	Limited empirical evidence.	Requires greater participation from the academic community in the design of standards.
(12)	Explore international regulatory frameworks (UNESCO, OECD).	Recognition of the need for moral accountability, transparency, and human oversight.	Lack of practical application in local contexts.	Translate global guidelines into adapted institutional policies.
(13)	Study teaching uses of GAI (writing, planning, assessments).	Increasing integration, but with concerns about academic integrity and plagiarism.	Small sample, focused on teachers.	Teacher training in the ethical and productive use of GAI.
(14)	Analyze teachers' perceptions of chatbots in educational practice.	Resistance to plagiarism and copyright risks, although some show openness.	No comparison with student perceptions.	Need for clear pedagogical strategies for the classroom.
(15)	Evaluate the impact on personalized learning and self-regulation.	GAI supports personalization, participation, and immediate feedback.	Specific context, lacking cultural diversity.	Promote innovative and context-sensitive curricular integration.

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Study	Objectives	Main findings	Limitations	Implications
(16)	Review the benefits and risks of GAI on academic productivity.	Improves performance and efficiency, but ethical and trust concerns persist.	Lack of longitudinal studies.	Requires ethical monitoring and critical training in digital skills.
(17)	Observe the institutional integration of GAI.	Growth in universities, but lacks integrity, privacy, and equity frameworks.	Actual impact still poorly documented.	Urgent regulation and teacher-student training.
(18)	Explore the effects of ChatGPT on assessments and Bloom's Taxonomy.	Useful for recall and comprehension; limited for creation and critical thinking.	Need for human oversight.	Redesign assessments to foster creativity and ethics.
(19)	Examine the global impact of GAI in higher education.	Contributes to personalization and efficiency, but raises ethical dilemmas, biases, and the digital divide.	Broad, non-empirical approach.	Clear policies, GenAI literacy, and ethical pedagogical guides.
(7)	Analyze ethical dilemmas of generative chatbots.	Identifies five key issues: privacy, bias, self-efficacy, plagiarism, and hallucinations.	Based on conceptual analysis.	Need for policies, transparency, and innovative pedagogical approaches.
(20)	An empirical study of student and faculty perceptions.	Extensive evidence on benefits (productivity, writing, access) and risks (dependency, ethics, plagiarism).	Descriptive approach, lacks longitudinality.	Integration of GAI into pedagogical strategies with digital ethics and clear policies.

The literature review reveals significant progress in understanding the integration of generative artificial intelligence in higher education, with contributions to the design of regulatory frameworks, exploration of teacher perceptions, identification of pedagogical benefits, and discussion of ethical risks. However, as shown in Table 1, important limitations persist: studies focused solely on a single actor (mainly teachers) predominate, with little comparative evidence between students and professors; furthermore, most of the work is developed in international contexts, without sufficiently addressing the reality of Latin American institutions. In this sense, the contribution of this study lies in offering an empirical and comparative characterization of the perceptions and practices of professors and students at the University de Córdoba, providing contextualized evidence on the opportunities, resistance, and challenges posed by the adoption of generative

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AI. This advances closing the gap identified in the literature and provides practical inputs for the formulation of pedagogical policies and strategies in the region.

Although previous research has documented the growing use of generative AI in education and pointed out ethical risks, training gaps, and institutional challenges, the literature still has significant limitations. In particular, studies predominantly focus solely on students or teachers, with little comparative evidence between the two groups. Likewise, concerns about privacy, misuse, and lack of regulation have been reported, but without analyzing how these perceptions translate into concrete practices within the same academic community. This study seeks to close these gaps by offering a two-way and contextualized view of the phenomenon based on empirical data that allow us to understand differences, convergences, and critical areas for institutional action.

Materials and Methods

To develop this research, an opinion survey was conducted to understand the use of generative artificial intelligence in the academic context of undergraduate students at the University de Córdoba. The time window for this study was March 1, 2025, to May 29, 2025.

Sample Design and Participant Selection

After the initial calculation, a correction factor for finite populations was applied, yielding a final sample size of 576 students and 88 faculty members. The selection was made through stratified random sampling, considering faculties and academic years, to ensure diversity in representation, as shown in Tables 2 and 3.

Table 2. Distribution of population size and sample of students.

Population	Sample Size	Margin of Error	Confidence Level
13810	576	4%	95%

Table 3. Distribution of population size and sample of teachers

Population	Sample Size	Margin of Error	Confidence Level
933	88	10%	95%

The sample size was calculated using Cronbach's formula for finite populations, adjusted to ensure representativeness with a 95% confidence level and a 4% margin of error. Using a conservative proportion (p=0.5) to maximize the sample size, the total population of students was 13,810, and for faculty, 933 (source: University de Córdoba Statistics Office), with a 95% confidence level and 10% margin of error.

Instrument and validation

The survey consisted of 25 items for teachers and 19 for students, and was structured into four sections.

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- Sociodemographic data (age, sex, academic program).
- Use of generative AI tools.
- Ethical Risk and Privacy.
- Perceptions of the future impact of generative AI.

The instrument was validated through expert judgment (three educational technology researchers) and a pilot test with 15 teachers, with a reliability of α=0.8361 (Cronbach's alpha), indicating acceptable internal consistency. Similarly, a pilot test of 30 students was conducted to obtain a Cronbach's alpha reliability of α=0.8151. The results are presented in Tables 4 and 5. Cronbach's alpha was used for this calculation (21).

Table 4. Cronbach's alpha teacher survey

Cronbach Alpha	Std. Alpha
0.8361	0.8341

Table 5. Cronbach's alpha student survey

Cronbach Alpha	Std. Alpha
0.8151	0.8308

Statistical analysis

Before using the t-test, the assumptions of normality and possible skewness were checked. Normality was assessed using the Shapiro–Wilk test and visual inspection of the Q–Q plots and histograms. In addition, skewness and kurtosis coefficients were calculated as descriptive indicators of the fit to the normal distribution. Given the sample size and ordinal nature of the Likert-type data, the t-test was considered reasonably robust to mild-to-moderate deviations from normality.

For items that showed high asymmetry (e.g., skewness > 1) or significant deviations detected by both the Shapiro–Wilk and Q–Q plots, complementary nonparametric analyses (Wilcoxon signed-rank test or sign test) were performed to test the robustness of parametric results. When subgroups were compared (when applicable), the homogeneity of variance was verified using Levene's test.

All analyses were performed with a significance level of α = 0.05, and adjusted or exact p-values were reported where appropriate. Effect sizes were considered when interpreting the results.

Ethical and Privacy Aspects

During the application of this instrument, respondents were informed about the purpose of the study and that certain personal data, such as age, gender, and academic program, could be used to characterize the survey population (students and faculty).

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Results

To process the questions from the questionnaires administered to teachers and students, Python and libraries (pandas, numpy, scipy, statsmodels, and matplotlib) were used. This analysis is divided into two parts: the first corresponds to the teachers' opinions and the second corresponds to the students' opinions. The analysis will then begin with teachers' opinions, followed by students' opinions. Table 6 presents the abbreviations for the statistical analyses used for both the teacher and student tests.

Table 6 Abbreviations for statistical analysis

Abbreviation	Description
mean	Arithmetic mean of item responses.
sd	Standard deviation (response variability).
t_stat	One-sample t-test statistic (comparison with the value 3).
p_t	P-value associated with the t-statistic (significance of the test).
shapiro_stat	W-statistic from the Shapiro–Wilk test (normality).
shapiro_p	Shapiro–Wilk p-value (p < .05 indicates deviation from normality).
skew	Distribution skewness: >0 right skew, <0 left skew.
kurtosis	Distribution kurtosis: >0 leptokurtic, <0 platykurtic.
ci_low	Lower limit of the confidence interval (usually 95%) for the mean.
ci_up	Upper limit of the confidence interval (usually 95%) for the mean.
run_nonparam	Indicates whether a complementary nonparametric test was applied (TRUE/ FALSE).
p_BH	Benjamini–Hochberg adjusted p-value for multiple comparisons.

Analysis of the results of teachers' perceptions

Table 7 shows the mean, standard deviation, t-test, and p-value for each question asked by the teachers during the instrument's administration.

Table 7 Results of the teachers' opinion survey.

Question	mean	sd	t_stat	p_t	shapiro_stat	shapiro_p	skew
Q1	3	1.03945167	0	1	0.89085601	2.02E-06	-0.37701147
Q2	4	0.77311134	12.1338687	2.08E-20	0.78586132	5.52E-10	-1.06902564
Q3	3.51136364	0.90964586	5.27349854	9.65E-07	0.86591114	2.07E-07	-0.36259028
Q4	3.56818182	0.85494444	6.23434422	1.58E-08	0.8406466	2.63E-08	-0.72528393
Q5	4.15909091	0.84263358	12.9038728	6.53E-22	0.8135883	3.56E-09	-0.78312822
Q6	2.94318182	0.9632077	-0.55336122	0.58143537	0.89158362	2.17E-06	-0.27935879
Q7	3.15909091	1.00443114	1.48582113	0.14094127	0.88098989	7.95E-07	-0.39747758
Q8	3.57954545	1.04740062	5.19058147	1.36E-06	0.84523349	3.76E-08	-0.79912272
Q9	2.67045455	0.90619313	-3.41142552	0.0009823	0.89263177	2.41E-06	0.04395032
Q10	4.19318182	0.67565132	16.5662929	1.21E-28	0.79306581	8.83E-10	-0.48243919
Q11	2.23863636	0.90964586	-7.85165339	9.90E-12	0.80052612	1.45E-09	0.91047704
Q12	1.89772727	0.94734684	-10.9149408	5.62E-18	0.81229876	3.25E-09	0.78921682
Q13	4.06818182	0.94437785	10.6106191	2.32E-17	0.79230913	8.40E-10	-1.31125587
Q14	3.125	0.95667648	1.22570583	0.22361704	0.8325161	1.41E-08	-0.49743696
Q15	3.40909091	0.94243953	4.07199908	0.00010244	0.85552724	8.63E-08	-0.65841873

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Q16	3.13636364	1.0303645	1.24150658	0.21775549	0.8832045	9.77E-07	-0.08610547
Q17	4.10227273	0.75870084	13.6288696	2.66E-23	0.79525099	1.02E-09	-0.98189132
Q18	3.70454545	0.68075501	9.70866487	1.59E-15	0.7496129	6.06E-11	-1.1182115
Q19	4.32954545	0.81256782	15.3491704	1.74E-26	0.76274921	1.31E-10	-1.07287351
Q20	3.18181818	0.89115003	1.9139378	0.05891576	0.85382684	7.51E-08	-0.66834272

kurtosis	ci_low	ci_up	run_ nonparam	p_BH
-0.34240667	2.77976124	3.22023876	False	1
2.40924485	3.83619336	4.16380664	True	8.33E-20
0.55394133	3.31862809	3.70409918	False	1.76E-06
1.30178773	3.3870364	3.74932724	True	3.16E-08
0.01832921	3.98055391	4.33762791	True	3.27E-21
-0.15024738	2.73909761	3.14726603	False	0.61203723
-0.60893658	2.94627228	3.37190953	False	0.17617659
0.04240833	3.35762247	3.80146844	True	2.26E-06
-0.45690162	2.47845057	2.86245852	False	0.00140329
0.1888451	4.05002498	4.33633865	False	2.42E-27
0.49998183	2.04590082	2.43137191	True	2.20E-11
-0.33229084	1.69700366	2.09845089	True	1.87E-17
2.18023641	3.86808727	4.26827637	True	6.62E-17
-0.87116191	2.92229962	3.32770038	False	0.24846337
-0.0368806	3.20940705	3.60877477	True	0.0001576
-0.96438387	2.91805026	3.35467701	False	0.24846337
2.34838983	3.94151938	4.26302607	True	1.78E-22
2.55709603	3.56030725	3.84878366	True	3.98E-15
0.5390156	4.15737878	4.50171212	True	1.74E-25
0.24153197	2.99300153	3.37063483	True	0.07855435

Use of Generative AI Tools

In a study on the use of generative AI tools in higher education, faculty perceptions and practices were assessed using a Likert scale ranging from one to five. A one-sample t-test was applied to analyze whether the means obtained in the responses differed significantly from the neutral midpoint (value of 3). The results showed highly significant differences ($p < 0.0001$) for all questions, indicating that the opinions and behaviors expressed were statistically relevant. Figure 1 shows the results of the questions related to faculty use of generative AI in higher education.

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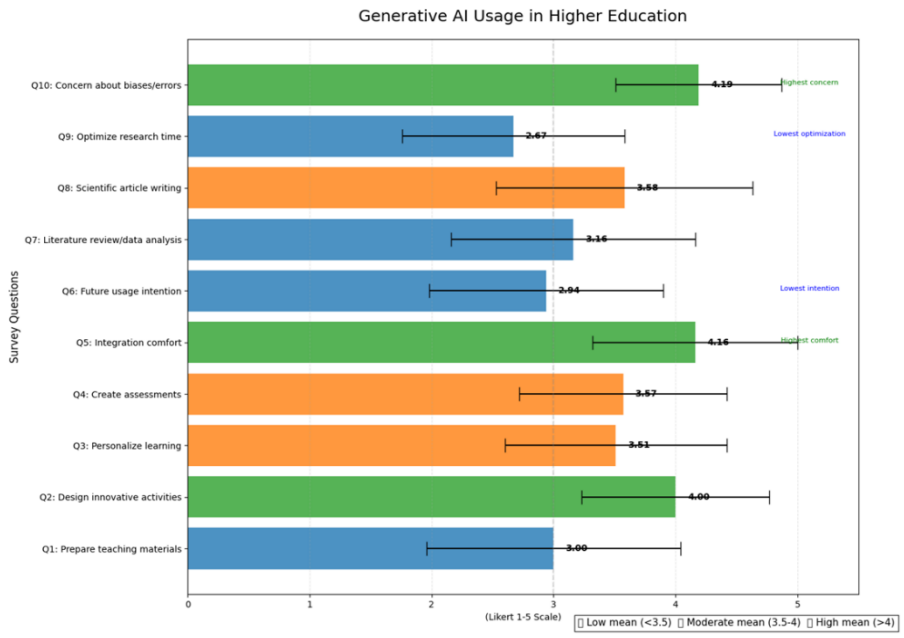

Figure 1. Use of generative AI in higher education teachers**.**

Regarding the frequency with which teachers reported using generative AI to prepare teaching materials (Q1), the mean score was 3.0 (SD = 1.04, t = 0.00), indicating a moderate and consistent level of usage. This suggests an intermediate degree of integration of generative AI into instructional design and teaching preparation processes.

For the perceived usefulness of generative AI in designing innovative learning activities (Q2), the mean was significantly higher (M = 4.0, SD = 0.77, t = 12.13), reflecting a strong appreciation and clear acknowledgment of AI's pedagogical potential to stimulate creativity and innovation in classroom practices.

Regarding the perceived contribution of AI to personalizing learning for students with diverse needs (Q3), the mean was 3.51 (SD = 0.91, t = 5.27), indicating that teachers recognized the positive role of AI in fostering inclusion and adapting learning experiences to individual differences.

Regarding satisfaction with using AI to develop assessments such as exams or rubrics (Q4), the mean was 3.57 (SD = 0.85, t = 6.23), denoting a moderate-to-high level of confidence and satisfaction in employing these tools for evaluation.

Finally, teachers' comfort with integrating generative AI into their teaching methodologies (Q5) showed the highest endorsement (M = 4.16, SD = 0.84, t = 12.90), revealing a favorable disposition and growing readiness to incorporate these technologies as allies in pedagogical innovation.

When asked about the likelihood of increasing AI use in teaching over the next year (Q6), the mean score was slightly below the midpoint (M = 2.94, SD = 0.96, t = –0.55), suggesting a cautious or ambivalent stance toward future adoption. For the use of AI in literature reviews and data analysis (Q7), a moderate level was observed (M = 3.16, SD = 1.00, t = 1.49), reflecting a gradual but not yet widespread adoption in academic research activities.

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The perceived value of AI in streamlining the writing of scientific articles (Q8) was notably positive (M = 3.58, SD = 1.05, t = 5.19), indicating that educators acknowledged its contribution to enhancing research productivity. However, perceptions of time optimization in research through AI (Q9) were more moderate (M = 2.67, SD = 0.91, t = –3.41), suggesting mixed or skeptical views regarding efficiency gains. The highest mean emerged in relation to concerns about potential biases or errors in AI-assisted research (Q10), with M = 4.19 (SD = 0.68, t = 16.57), indicating strong critical awareness of the ethical and methodological risks associated with these technologies.

Taken together, these results indicate that faculty members hold a generally positive view of generative AI in higher education, particularly valuing its potential for innovation, personalization, and productivity. Nonetheless, they adopted a reflective and cautious stance, emphasizing the importance of managing associated risks to ensure responsible and effective implementation.

Generative AI is increasingly perceived as a valuable resource for transforming traditional pedagogical practice. The high ratings for its usefulness in designing innovative activities and the comfort expressed with its integration into teaching methodologies demonstrate an emerging cultural shift toward acceptance and pedagogical experimentation. Simultaneously, the moderate use in material preparation and personalization tasks suggests that adoption, while growing, remains uneven across disciplines.

The hesitation to expand AI use in the near future, coupled with significant concerns about bias and reliability in research contexts, highlights the need for sustained institutional support. This includes comprehensive professional development, clear ethical guidelines, and coherent institutional policies to ensure informed, critical, and ethically responsible engagement with GAI in academic environments.

Overall, these findings portray a landscape of increasing acceptance and recognition of the transformative potential of generative AI in higher education, balanced by an awareness of its ethical, methodological, and pedagogical implications.

Ethical and Privacy Risks in the Use of Generative AI

The first item (Q11), which explored the challenges encountered when using AI tools, yielded a mean score of 2.24 (SD = 0.91, t = –7.85). This suggests that teachers do not perceive significant difficulties in employing these technologies or have progressively developed strategies to manage them effectively. The relatively low mean score may indicate growing familiarity with and adaptation to the use of generative AI in academic contexts. However, this could also reflect limited awareness of the more subtle or latent risks associated with its use, as illustrated in Figure 2.

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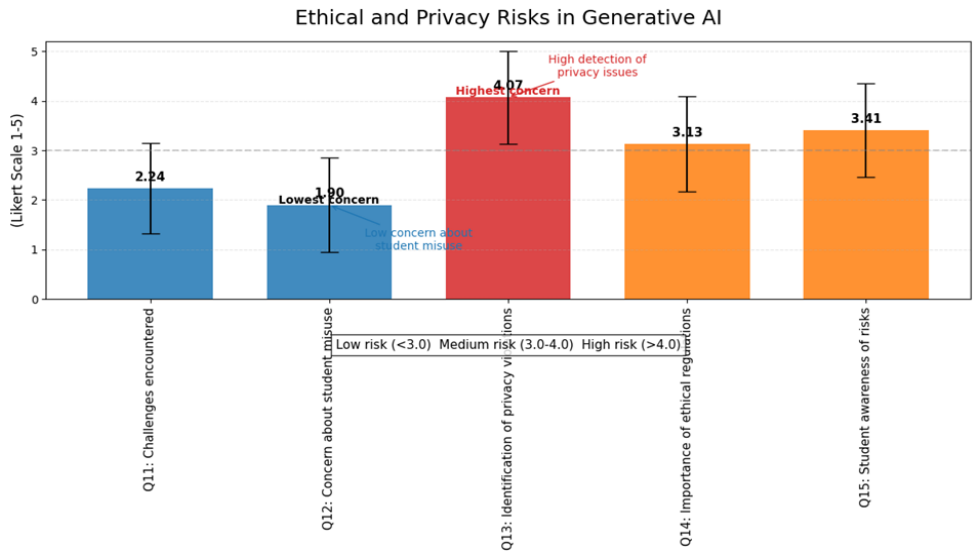

Figure 2. Ethical and Privacy Risks in the Use of Generative AI.

In contrast, concern about students' inappropriate use of AI (Q12) scored lower, with a mean of 1.90 (SD = 0.95, t = –10.91). This result reflects a high degree of concern and sensitivity among teachers toward potential academic misconduct, such as plagiarism or unauthorized task delegation, issues widely discussed in the literature on academic integrity and artificial intelligence.

Regarding the frequency with which faculty members identified privacy violations (Q13), the mean was notably high (M = 4.07, SD = 0.94, t = 10.61), indicating that this aspect is perceived as a persistent and tangible concern in teaching practices. Such apprehension may stem from the use of platforms that collect sensitive information or store user-generated data without explicit consent from the user.

The importance of establishing clear institutional regulations for the ethical use of AI (Q14) yielded a mean of 3.13 (SD = 0.96, t = 1.23). Although this mean is close to the midpoint of the scale, the positive t-value suggests a moderate level of agreement among faculty members on the necessity of implementing institutional ethical guidelines for research.

Finally, the perceived level of students' ethical awareness when using AI (Q15) averaged 3.41 (SD = 0.94, t = 4.07), suggesting that teachers believe that students possess a certain degree of ethical awareness, although it remains uneven and insufficient across the academic community.

Collectively, these results indicate that university faculty members are aware of the ethical challenges associated with the integration of generative AI in academic contexts. The combination of strong concerns about student misuse (Q12) and the high perceived frequency of privacy violations (Q13) underscores the urgent need to cultivate a robust institutional culture of digital ethics. Likewise, the call for clear regulations (Q14) reflects the expectation that universities will develop normative frameworks to guide the responsible and transparent use of these technologies an observation consistent with recent studies emphasizing the absence of institutional policies as

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a major barrier to effective and safe AI adoption (22), (23), (24) (25). Meanwhile, the moderate perception of students' ethical awareness (Q15) points to the need to strengthen ethics education and digital literacy in university curricula. Finally, the low mean value associated with experienced challenges (Q11) may reflect both technological adaptation and a potential underestimation of less visible or emerging risks.

Insights into the future impact of generative AI

Regarding the anticipated transformation of teaching methods over the next five years (Q16), faculty members expressed a moderate level of agreement (M = 3.14, SD = 1.03, t = 1.24), suggesting a measured and realistic expectation of the potential impact of generative AI on pedagogical practices. However, the considerable variability observed in the responses reflects the coexistence of both enthusiasm and skepticism toward this technological evolution.

Conversely, a large proportion of teachers agreed that generative AI will likely replace certain traditional teaching functions (Q17), such as assessment and instructional material design, with a high and consistent level of agreement (M = 4.10, SD = 0.76, t = 13.63). This finding reveals the widespread recognition of AI's capacity to automate routine academic tasks.

Regarding the perceived potential of generative AI to enhance educational equity through personalized learning (Q18), the results indicated a moderately high level of agreement (M = 3.70, SD = 0.68, t = 9.71), highlighting a positive and relatively homogeneous perception of its benefits. In terms of individual readiness to adapt to the disciplinary changes brought about by AI (Q19), teachers reported a notably high mean (M = 4.33, SD = 0.81, t = 15.35), suggesting substantial confidence and self-efficacy in facing the emerging challenges.

Finally, when asked about the future importance of mastering generative AI tools in their professional fields (Q20), the responses reflected a moderate level of agreement (M = 3.18, SD = 0.89, t = 1.91), implying that although the educators acknowledged its relevance, there was no unanimous conviction regarding its essential nature.

Overall, university faculty members perceive generative AI as a transformative force in higher education, although their perspectives remain heterogeneous. There is a strong consensus regarding its ability to automate certain academic processes (Q17) and promote educational equity (Q18). However, attitudes were more reserved regarding its broader transformative potential for pedagogy (Q16) and its indispensable role in future professional practice (Q20). The high self-reported readiness to adapt (Q19) demonstrates confidence that is likely linked to increasing exposure to AI and access to institutional training opportunities. Nevertheless, the moderate perception of transformation and essential mastery may reflect cautious optimism or latent resistance to radical pedagogical change. The positive outlook on AI's potential to foster inclusivity (Q18) is particularly encouraging for universities striving to address student diversity; however, this optimism may still be grounded more in theoretical expectations than in concrete experience. The detailed results are shown in Figure 3.

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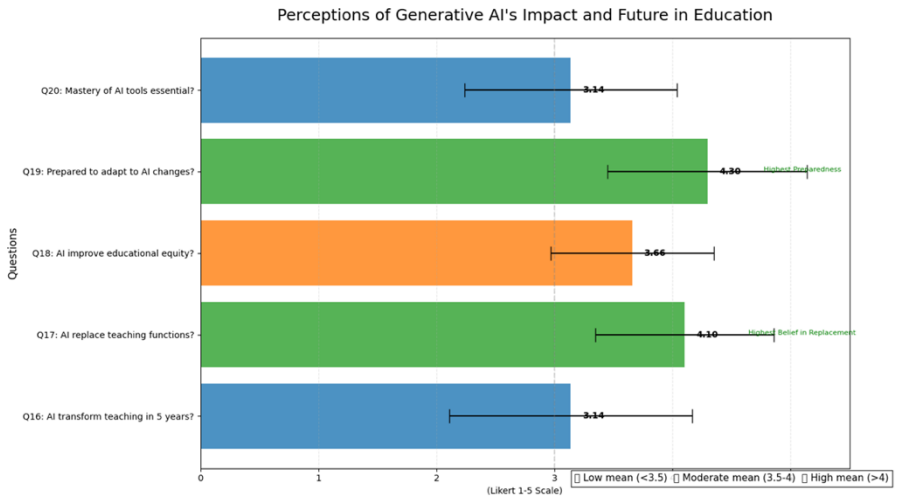

Figure 3. Perception of the future impact of generative AI.

Overall, the findings indicate that although faculty members acknowledge the transformative potential of generative AI, its effective and sustainable integration into teaching practices still requires targeted professional development and deeper critical reflection. Strengthening educators' pedagogical and ethical competencies in the use of these technologies is essential to bridge the gap between traditional educational models and emerging digital paradigms. Consequently, higher-education institutions should consider these insights when designing faculty development initiatives and institutional policies that foster the critical, reflective, and quality-oriented adoption of generative AI in academic practice.

Analysis of the results of students' perception

Table 8 shows the results of the study on university students in relation to generative AI in higher education. A one-sample t-test was used to determine whether the means differed significantly from the neutral value (3). In all cases, the t-values were highly significant ($p < 0.0001$), indicating that the responses were not a result of chance but rather reflected consistent trends. This p-value is similar to that found in professors' opinions.

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Table 8. Results of student opinion survey.

Question	mean	sd	t_stat	p_t	shapiro_stat	shapiro_p	skew	kurtosis	ci_low	ci_up	run_ nonparam	p_BH
Q1	3.53125	0.75921871	16.7935799	8.53E-52	0.84279762	1.92E-23	0.15716296	-0.12178747	3.4691175	3.5933825	False	1.33E-51
Q2	3.28993056	0.82838932	8.39983468	3.51E-16	0.87170368	2.34E-21	0.07907796	0.00727058	3.22213731	3.35772381	False	4.46E-16
Q3	1.99826389	1.09305974	-21.9948333	2.92E-78	0.8183584	5.48E-25	0.82929207	-0.22940278	1.90881069	2.08771708	True	6.80E-78
Q4	3.33333333	1.07298851	7.45581142	3.31E-13	0.88135955	1.39E-20	-0.5500208	-0.03439499	3.24552272	3.42114395	True	3.86E-13
Q5	1.640625	0.76511934	-42.6404068	3.38E-180	0.67983753	1.48E-31	1.69350314	3.985784	1.5780096	1.7032404	True	4.73E-179
Q6	3.10590278	1.2472857	2.0377582	0.04203133	0.90288286	1.14E-18	-0.24992692	-0.95179686	3.00382813	3.20797743	False	0.04203133
Q7	1.96006944	1.07143268	-23.294355	4.98E-85	0.81131308	2.10E-25	0.97351166	0.16379204	1.87238615	2.04775274	True	1.74E-84
Q8	3.234375	1.03281748	5.44626721	7.63E-08	0.90165295	8.68E-19	-0.34799307	-0.27425324	3.14985188	3.31889812	False	8.22E-08
Q9	3.75694444	0.93061197	19.5212045	1.71E-65	0.85093488	6.91E-23	-0.82420208	0.76938284	3.68078556	3.83310333	True	2.99E-65
Q10	4.20833333	0.89733906	32.3177729	2.13E-131	0.76969063	1.22E-27	-1.3781361	2.25830831	4.13489741	4.28176925	True	9.95E-131
Q11	4.19097222	0.8474956	33.7268221	2.22E-138	0.79579599	2.81E-26	-1.09698508	1.43712456	4.12161536	4.26032908	True	1.55E-137
Q12	3.86631944	0.94611939	21.9757324	3.67E-78	0.85909645	2.63E-22	-0.63304334	-0.16156438	3.78889147	3.94374742	True	7.33E-78
Q13	3.80902778	0.87773726	22.1212742	6.42E-79	0.86440166	6.47E-22	-0.54761377	0.21806729	3.73719602	3.88085954	True	1.80E-78
Q14	3.48090278	0.82334411	14.0180351	1.29E-38	0.85807134	2.22E-22	-0.21079022	0.46045383	3.41352241	3.54828314	False	1.81E-38

Use of Generative AI Tools

Students reported being relatively familiar with generative AI tools such as ChatGPT, Gemini, and DeepSeek (Q1), with a mean score of 3.53, standard deviation of 0.76, and t-value of 16.79. This score, positioned above the neutral point, indicates that students generally recognized and engaged with these tools to some extent. The low variability in the responses suggests a shared perception among most participants. Regarding the frequency of use (Q2), the mean was 3.29, with a standard deviation of 0.83 and a t-value of 8.40. This result reflects a moderate but growing use of generative AI, implying that these technologies are progressively becoming part of students' academic and personal lives. Although the frequency is not exceptionally high, it clearly exceeds the midpoint of the scale, revealing the notable presence of AI tools in students' educational experiences.

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In contrast, the specific use of generative AI in more structured contexts, such as employing chatbots as assistants in university courses (Q3), was considerably lower, with a mean of 2.00, a standard deviation of 1.09, and a t-value of -21.99. This suggests that the formal integration of AI tools into teaching and learning environments is limited. The relatively high dispersion indicates that, while most students have not yet used these tools for curricular purposes, a smaller group has done so, possibly reflecting isolated initiatives or pilot projects in specific courses.

Taken together, these findings suggest that university students are increasingly familiar with and regularly use generative AI tools, yet their application in formal academic settings is still in its infancy. This scenario highlights the opportunity for higher education institutions to promote the structured and ethical integration of AI tools into pedagogical practices, supported by clear technological and educational frameworks. The results are summarized in Figure 4.

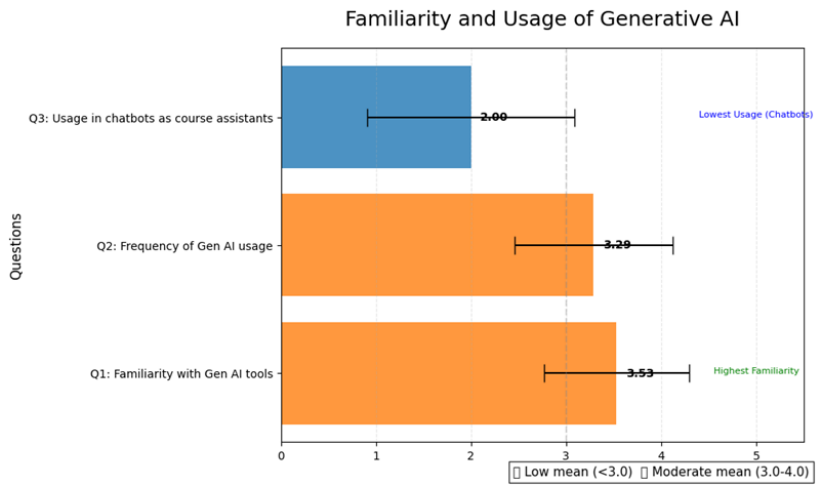

Figure 4. Use of generative AI tools.

Ethical and Privacy Risks in the Use of Generative AI

Regarding students' awareness of the ethical risks associated with the use of generative AI (Q4), the mean score was 3.33 (standard deviation = 1.07, t = 7.46), indicating a moderate level of ethical awareness among participants. Although many students acknowledged the ethical dilemmas inherent in these technologies, the considerable dispersion in responses suggests that a portion of the population still lacks a full understanding of the moral implications involved in their academic use.

Regarding the potential overreliance on generative AI (Q5), the mean score was 1.64 (standard deviation = 0.77, t = -42.64), a notably low value that reflects a general perception among students that they do not depend excessively on these tools. This finding may indicate a balanced use of AI; however, it could also suggest a certain underestimation or lack of self-awareness regarding the actual frequency and intensity of AI use in academic tasks.

Regarding the perceived impact of generative AI on critical thinking (Q6), the mean was 3.11 (standard deviation = 1.25, t = 2.04), slightly above the neutral point, indicating divided opinions. While some students expressed concern that reliance on AI-generated outputs may diminish

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their analytical and reflective capacities, others did not perceive this as a significant threat to their learning. The high standard deviation reinforces the heterogeneity of perspectives on this issue.

Finally, with respect to perceptions of privacy and security risks (Q7), the mean score was 1.96 (standard deviation = 1.07, t = -23.29), suggesting that most students did not experience any clear privacy threats when using generative AI tools. Nevertheless, the variability in responses points to a subgroup that is concerned about the handling and storage of personal data by these platforms. Limited technical understanding of data governance and cybersecurity likely contributes to the generally low perception of vulnerability among healthcare professionals.

Taken together, these results reveal that students exhibit moderate ethical awareness and maintain a critical but uneven understanding of the potential risks associated with generative AI. The distribution of the responses is illustrated in Figure 5.

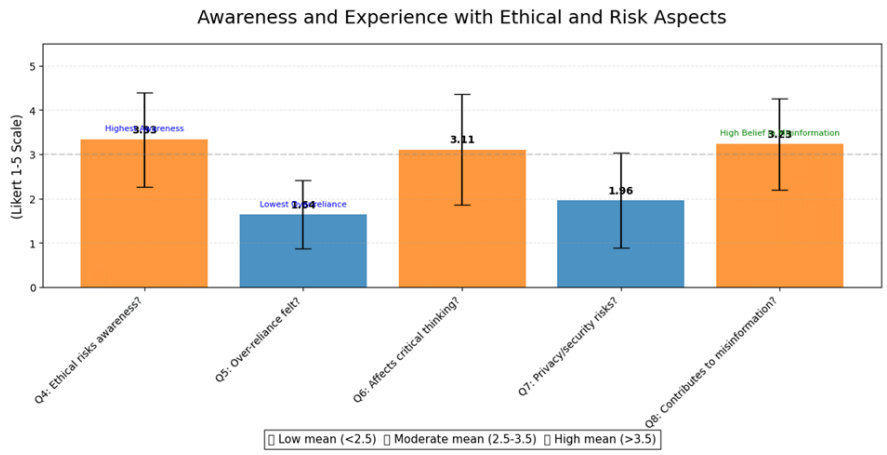

Figure 5. Ethical risks and privacy.

Finally, regarding the potential contribution of generative AI to disinformation in academic contexts (Q8), the mean score was 3.23 (standard deviation = 1.03, t = 5.45), indicating a moderate level of concern among students. This suggests that while students acknowledge the advantages of generative AI in streamlining tasks and providing valuable academic support, they are also aware of its potential to generate or amplify misinformation, an issue that entails significant ethical and scholarly risks.

Overall, these findings reveal that university students maintain a balanced and critical perception of the risks associated with Gen AI. Although they did not perceive themselves as overly dependent on these tools, they expressed awareness of ethical challenges, disinformation threats, and possible impacts on critical thinking skills. The relatively low perception of privacy risks may reflect a false sense of security or limited understanding of data management processes, underscoring the importance of strengthening digital and ethical literacy in higher education.

Insights into the future impact of generative AI

Students exhibited a predominantly optimistic view of the future impact of generative AI on their academic disciplines and professional careers (Q9). When asked how they believe these

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technologies will influence their professional fields, the mean response was 3.76 (standard deviation = 0.93, t = 19.52), suggesting a strong conviction that generative AI will transform processes, tasks, and models of professional practice, although opinions differ on whether these changes will be gradual or disruptive.

Moreover, there was a clear consensus on the importance of incorporating formal training in the ethical and responsible use of generative AI within university curricula (Q10), as reflected by a mean score of 4.21 (standard deviation = 0.90, t = 32.32). This finding demonstrates that students value technical competence in AI and recognize the need to understand its ethical implications before integrating such tools into their future professional contexts.

Collectively, these insights point to a generation of students that is both receptive to technological innovation and conscious of its broader social and ethical dimensions, an attitude that higher-education institutions should foster through comprehensive interdisciplinary AI education programs (see Figure 6).

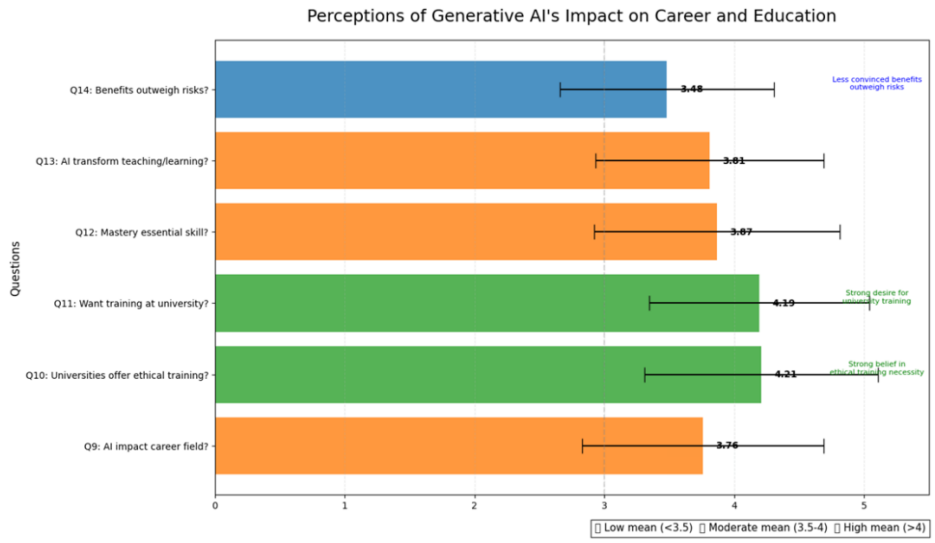

Figure 6. Perception of the future impact of generative AI.

In parallel, the students expressed a strong interest in receiving practical training on generative AI technologies. The mean score for the question regarding their willingness to receive training in this field (Q11) was 4.19 (standard deviation = 0.85, t = 33.73), revealing a clear demand for educational programs that go beyond ethical reflection to include technical competence and applied knowledge in the curriculum. These finding highlights students' aspirations to acquire concrete skills that will enable them to fully harness the potential of AI in both academic and professional contexts.

Consistently, students also perceived mastery of generative AI tools as a key professional competency for the near future (Q12), with a mean score of 3.87 (standard deviation = 0.95, t = 21.98). These results suggest that most students regard AI literacy as essential for employability and competitiveness, although opinions vary regarding the immediacy and relevance of such training across disciplines.

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Similarly, the expectation that generative AI would transform teaching and learning methodologies within their academic field (Q13) yielded a mean score of 3.81 (standard deviation = 0.88, t = 22.12), indicating that students foresee substantial changes in pedagogical practices. Some envision the integration of virtual assistants and AI-generated learning materials, whereas others anticipate more targeted applications focused on optimizing specific academic tasks.

Finally, when asked whether they believed that the benefits of generative AI outweighed its ethical or occupational risks (Q14), the mean score was 3.48 (standard deviation = 0.82; t = 14.02). Although the majority of students held a positive outlook, these results revealed cautious optimism acknowledging the transformative potential of AI while remaining aware of associated risks such as bias, misinformation, and labor displacement.

Taken together, these findings reflect a balanced stance among university students: they are enthusiastic about the transformative potential of generative AI, actively demand both technical and ethical training, and demonstrate awareness of the need for responsible and critical management of its associated risks.

Discussion

The results of this study show that the adoption of generative AI is widespread among higher education students and faculty, although there are notable differences in usage patterns and risk management. More than 90% of students reported interacting at least once with tools such as ChatGPT and Gemini, among others, and around 56% used them several times a month. This high level of familiarity contrasts with the more moderate adoption among faculty, of whom approximately 41% use generative AI once or twice a month to design course materials, and 28% do so weekly. However, despite its penetration, significant gaps in understanding the ethical and privacy implications remain. Among the students, 47% developed a strong awareness of the risks of bias and misinformation that can come with using these systems, but 16% reported virtually no awareness. Furthermore, although a third expressed concerns about their data privacy, 43% did not identify significant risks in their daily interactions with technology. However, the analysis of faculty perceptions of the future impact of generative AI reveals an ambivalent attitude: on the one hand, they recognize its potential to replace certain traditional functions and improve educational equity, while on the other, they are skeptical about its ability to radically transform teaching methods. Furthermore, although the faculty feel prepared to face these changes, not all consider mastery of generative AI tools essential for professionals in their field. These results underscore the need to strengthen digital competencies and critically reflect on the incorporation of generative AI into higher education.

AI generates mixed perceptions regarding its impact on academic skills. While 43.6% of students believed that their critical thinking could be impaired by relying on automatically generated answers, only 30% believed that this ability was not affected. Furthermore, although the frequency of use of these tools was low (5%), 34% experienced it occasionally and 29.5% occasionally, which highlights the urgent need to design training strategies that promote a balanced and conscious use of these tools. Globally, there have been experiences of implementing teacher training programs in generative artificial, such as those at Stanford University and Harvard University, which have

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developed institutional AI literacy programs for teachers aimed at the ethical and pedagogical use of tools such as ChatGPT and Claude in teaching and assessment (25). In Latin America, the University of Buenos Aires and the National Autonomous University of Mexico (UNAM) have begun offering diplomas and workshops on generative AI and university teaching, focusing on digital skills, ethics, and AI-assisted academic production.

Conclusions

Generative AI has become a recurring resource in higher education, providing support in content generation and pedagogical design tasks; however, it also poses challenges related to academic integrity and equity in access. The lack of uniform awareness of bias, misinformation, and privacy underscores the need to include digital literacy and AI ethics programs in curricula. Furthermore, the perception of potential harm to the development of critical thinking requires the creation of responsible use guides that promote reflective analysis of the results provided by these systems.

To ensure equitable deployment, it is essential to improve the institution's technological infrastructure in development centers and articulate institutional policies that guarantee universal access. The high demand for technical and ethical training, consistently expressed by students and faculty, must be translated into concrete actions, such as intergenerational workshops, cross-curricular modules, and clear guidelines that frame the use of generative AI in teaching and learning. Only in this manner will it be possible to harness the full potential of these tools while mitigating their risks and reinforcing the critical and responsible profile of the academic community. Emphasis should be placed on clear policies and transparency, as most students consider establishing institutional standards essential. It is suggested that a code of good practices for generative AI be developed, inspired by models that integrate student perspectives into its training. This should explain when and how to use AI (for example, for reviewing drafts vs. formal assessment) to ensure academic integrity without ineffective blanket prohibitions. Finally, innovative pedagogical use in training teachers in AI integration methodologies in the classroom (AI-assisted flipped classroom and automated generation of teaching materials, among others).

Operational Recommendations from the Study

Based on the findings and in line with the identified challenges (teacher training, ethics, privacy, usage gaps, and lack of institutional guidelines), a 12-month Institutional Action Plan for the Ethical and Pedagogical Integration of Generative AI at the University de Córdoba is proposed. This plan translates the study's recommendations into concrete actions, defined responsibilities, and verifiable indicators, which are organized into six strategic axes:

1. Teacher training and critical digital literacy.

This includes an initial assessment, training courses, workshops by faculty, and communities of practice. Responsible: Academic Vice-Rector's Office and CINTIA. Indicators: percentage of trained faculty and the number of mentoring sessions conducted.

2. Participatory development of institutional policies.

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It provides for the formulation, validation, dissemination, and monitoring of guidelines for the responsible use of AI. It involves the rector's office, governing council, and legal and academic offices. Indicators: approval of the official document and acceptance of surveys.

3. Curricular transformation and cross-curricular integration.

This includes course mapping, subject redesign, pilot experiences, and progressive expansion. Responsibilities: Deanships and curriculum committees. Indicators: number of adjusted programs and evaluation reports.

4. Student awareness and participation.

This includes ethical campaigns, co-creation spaces, student networks, and events such as hackathons. Indicators: number of students enrolled and their active participation.

5. Infrastructure strengthening and equitable access.

It considers technological evaluation, tool licensing, and experimental laboratories. Indicators: resource availability and campus coverage.

6. Evaluation, monitoring, and continuous improvements.

Articulates impact metrics through periodic reports, perception surveys and institutional recommendations. Responsible: IA Monitoring Committee.

This plan offers an operational path that addresses the needs identified in the study and responds to the evaluator's demands by translating general recommendations into scheduled actions with metrics and responsible entities for their implementation.

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