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Satisfacción estudiantil sobre la GenAI: un análisis de los factores de percepción en el contexto universitario

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Student satisfaction with GenAI: an analysis of perception factors in the university context

Resumen

El uso constante y predilecto de la Inteligencia Artificial Generativa (GenAI) en el contexto de la educación superior es una realidad insoslayable. Su empleo como recurso de apoyo de los procesos de enseñanza, aprendizaje y evaluación está siendo crucial, no obstante, la comprensión sobre la percepción que tienen los usuarios, especialmente los estudiantes, sobre estas tecnologías resulta de mucha trascendencia para el desarrollo de conocimiento relativo a su implementación pertinente y sensata. Esta investigación se propone como objetivo principal analizar la satisfacción de los estudiantes con GenAI en el escenario universitario. La misma procede desde un enfoque cuantitativo que conjuga el análisis descriptivo con métodos inferenciales no paramétricos, específicamente la prueba H de Kruskal-Wallis y la prueba Wilcoxon. Una encuesta estructurada a escala Likert fue el instrumento aplicado a 471 estudiantes de ingeniería de una universidad privada en Colombia a fin de evaluar diversas dimensiones de percepción, incluyendo percepción general, retroalimentación, usabilidad, motivación y personalización. Los resultados exponen un alto nivel general de satisfacción (puntuación media = 4.23), dato que sugiere una percepción favorable de GenAI como recurso de apoyo de los procesos académicos. Estos hallazgos también revelan diferencias sustanciales en varias dimensiones evaluadas, que a su vez significan discrepancias en las experiencias de los usuarios, exceptuando la personalización, puesto que es una dimensión que arrojó resultados muy similares. Los hallazgos generales de esta investigación refieren que existe una importante aceptación y percepción positiva hacia la GenAI, pese a ello, su incorporación continúa demandando estrategias pedagógicas que promuevan un uso responsable. Esta investigación aporta evidencia empírica sobre la satisfacción de los estudiantes con GenAI y destaca la importancia de abordar la variabilidad en la experiencia del usuario. La investigación futura debería explorar estas percepciones en contextos más amplios y a lo largo del tiempo para comprender mejor su evolución.

Palabras clave: Educación superior, estudiantes de ingeniería, inteligencia artificial generativa, satisfacción estudiantil.

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Keywords: Higher education, engineering students, generative artificial intelligence , student satisfaction.

Abstract

The constant and widespread use of Generative Artificial Intelligence (GenAI) in higher education is an undeniable reality. Its use as a support resource for teaching, learning, and assessment processes is crucial; However, understanding users' perceptions, especially those of students, of these technologies is of great importance for developing knowledge regarding their appropriate and sensible implementation. This research aims to analyze student satisfaction with GenAI in the university setting. It employs a quantitative approach that combines descriptive analysis with non-parametric inferential methods, specifically the Kruskal-Wallis H test and the Wilcoxon signed-rank test. A structured Likert-scale survey was administered to 471 engineering students at a private university in Colombia to evaluate various dimensions of perception, including general perception, feedback, usability, motivation, and personalization. The results show a high overall level of satisfaction (mean score = 4.23), suggesting a favorable perception of GenAI as a support resource for academic processes. These findings also reveal substantial differences across several evaluated dimensions, which in turn indicate discrepancies in user experiences, with the exception of personalization, which yielded very similar results. The overall findings of this research indicate significant acceptance and a positive perception of GenAI; However, its integration continues to require pedagogical strategies that promote responsible use. This research provides empirical evidence on student satisfaction with GenAI and highlights the importance of addressing variability in user experience. Future research should explore these perceptions in broader contexts and over time to better understand their evolution.

Introduction

The introduction of Generative Artificial Intelligence (GenAI) into the educational landscape has been driven by the promise of transforming it through task optimization and constant innovation. It is worth noting that this important tool, through its diverse features and applications, offers countless benefits to teaching and learning by incorporating content and experiences that align with students' interests. All of these aspects are of academic interest precisely because of the opportunities for engaging and comprehensive learning experiences that it seems to guarantee.

As argued in [1], these languages offer an interesting opportunity for students to learn by filtering vast amounts of information. However, the long-term survival of these tools in the academic environment will be determined primarily by what the primary end user, the students, think and feel [2] . It is worth noting that several studies report high levels of student satisfaction when using AI tools in learning.

For their part, [3] describe how AI can improve student performance and especially the ability to process information. Therefore, it is becoming increasingly important for educators and technology developers to understand how GenAI is used, what students' expectations are, what benefits are recognized, and what kinds of limitations students face.

Although concern about these tools applied in the educational setting has intensified recently, the literature on student satisfaction with these technologies is still rapidly growing and evolving. It is worth noting that [4] report that students feel motivated to use such tools, and more specifically ChatGPT, to address learning tasks.

According to a review of various studies, it is still premature to draw a definitive conclusion regarding student satisfaction with the use of artificial intelligence-based tools. However, some findings highlight key issues that offer a more or less general perspective on their adoption, such as the ethical concerns associated with their use, data privacy, the inherent trends of the algorithms themselves, and even the increasing replacement of traditional personnel and tools in various work contexts [6].

Considering the points raised so far, it is important to note that this study aims to explore the factors that predominate in the perception of artificial intelligence users, specifically students. To achieve this objective, a two-pronged statistical approach is proposed: descriptive analysis and non-parametric inferential tests. The intention is to generate a comprehensive analysis that reveals how these ubiquitous tools are valued in our times.

As previously mentioned, it is still too early to establish a definitive perspective on the acceptance, rejection, or criticism of GenAI, as this is a topic that is still developing and

evolving. While in recent times its assessment has tended to be positive, even being considered a useful and practical tool that can favorably impact student motivation and performance [7] - [9], this does not mean that such a view is immutable; in fact, this assessment may change according to the effects that its use may produce in the near future.

Currently, there is a point that deserves to be highlighted and is made explicit by [10], who comment that students appreciate the support they find in these resources, especially when learning English or engineering subjects, since they consider the way in which the GenAI-based tool presents random guidelines that force them to reason about the information they receive instead of just getting the answer right and memorizing the indication or instruction to be challenging and stimulating.

Similarly, findings such as those of [11] have shown that students place great trust in ChatGPT responses, given their highly persuasive structure and semantics. However, it is important to note that these tools can make omissions, errors, or misrepresentations in their responses, requiring users to possess evaluative, critical, and problem-solving skills.

According to [12], ChatGPT can be a tool for individualized learning, responding to student needs and providing a much more dynamic personal learning experience through the creation of contextual and coherent responses. This perspective is somewhat shared by [13], who argue that this tool establishes a more engaging and effective relationship between students and learning, making the process more satisfying.

Contrary to the idea held by the collective imagination, various scholars of these tools, such as [14], point out that many students view the use of chatbots in a study context positively, and some even fully trust this tool to the point of believing that it can increase their learning outcome; however, these same researchers indicate that very few students prefer these technologies to a traditional teacher and class.

Additionally, [15] state that integrating ChatGPT into the flipped classroom strategy improves academic performance due to the constant and individualized participation of students. Generative text tasks (LLM) can support independent learning, providing stimuli to explore different content independently. With these tools, students have ideas and resources that provide crucial support to their learning process [1], [16].

In general, the reception and perception of GenAI in education have been positive, as demonstrated by various studies that refer to students' favorable and receptive attitudes toward these tools. These same studies indicate how users report a slight to strong influence on the improvement of their academic and technical skills. Specifically, [17], [18], [19] point out that students' perceived satisfaction can have a significant influence and can also indicate the degree to which the technology is being adopted. These authors state that the more satisfied a student is, the more they will use the technology

in the future.

From other perspectives, GenAI introduces certain barriers or limiting factors for students. In this regard, [20] describe how the integration and use of these tools in assessment systems have generated discussions about student motivation, anxiety, learning opportunities, and achievement. For their part, [21] report that one of the most common concerns is the inconsistent/variable quality and unreliability of AI output; student feedback frequently indicates that the answers are incorrect. In this sense, [22] identified that some AI-returned responses were classified as containing errors, such as missing descriptions, incoherent answers, or misinterpretations of words with similar meanings.

Excessive dependence on and indiscriminate use of generative artificial intelligence tools constitutes one of the latent fears in the academic context, and one of the most significant concerns relates to the lack of depth in the learning achieved. In other words, the ease of access to automated solutions and answers leads students to obtain immediate responses without experiencing a process of deep understanding of the academic content [23]-[25]. This situation requires timely attention; however, it is a problem that transcends the academic sphere, indeed involving moral and ethical issues that affect holistic education.

Despite the somewhat apprehensive attitude of teachers toward the inclusion of GenAI in the learning process, student acceptance is quite widespread and significant. In general, students express a positive disposition toward the tools in question, as shown in Figure 1, which summarizes the most salient findings regarding students' perceptions of GenAI in assessment. Specifically, three key elements are presented: advantages, opinions, and disadvantages.

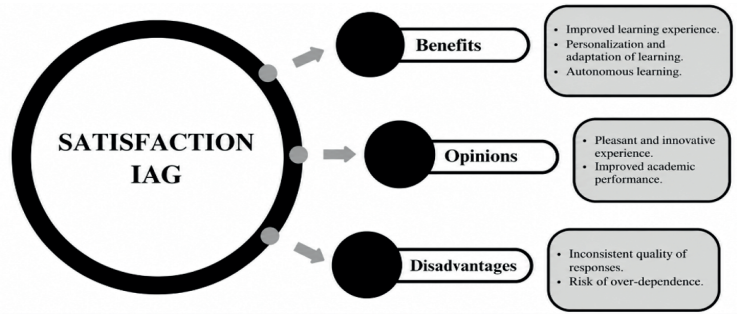

Figure 1. Benefits, opinions and disadvantages regarding the use of GenAI in assessment

Regarding the advantages, improved learning is observed, which is also personalized, adapted to the student's pace, and tends to favor decision-making and cognitive autonomy in general. In this respect, the students believe the tool is good and, in that sense, have revealed a positive perception in the instrument applied to explore their perception of the experience provided by GenAI, which is also described as a pleasant experience, even though the tool sometimes presents disadvantages related to the quality of the

responses it generates.

The graph also illustrates how the use of AI presents drawbacks related to variations in the quality of certain responses and, obviously, some risks associated with excessive dependence on a system whose constant use could hinder the development of cognitive skills such as critical thinking, reflection, argumentation, and cognitive autonomy. Overall, the figure provides an accurate representation of the perceived effect of GenAI on students' learning experience.

Materials and Methods

This research aims to analyze student perceptions and satisfaction with the use of GenAI in assessment processes. To achieve this objective, an analysis based on data obtained from a user satisfaction and experience survey is presented. It is developed using a statistical approach that combines descriptive analysis and non-parametric inferential tests. [26]

This study included a descriptive sociodemographic analysis to contextualize the characteristics of the sample. Non-parametric tests were applied to evaluate differences between groups, given the ordinal nature of the data obtained using a Likert scale. Furthermore, the most appropriate response variable to explain the variations in user experience was identified. [27]

The descriptive analysis of the collected data was based on the responses of 471 engineering students from a private university in Colombia. The study aimed to evaluate the level of satisfaction and experience with using generative artificial intelligence. The sample was selected by convenience sampling or non-probability sampling to ensure full access and availability to the participants.[28]

Specifically, a transformer model was used, based on advanced neural network architecture, which produces outputs appropriate to the context or reference input provided by the user. This model generates these responses using information retrieval techniques (RAG), and in the scenario where it was implemented, it serves to assist both autonomous and mediated learning.

To implement this transformer model, it was necessary to collect basic information related to user identity, including email address, gender, age, and marital status. Additionally, 13 questions were formulated using a 5-point Likert scale. It is important to note that the entire data collection process was conducted in accordance with ethical principles and with the prior consent of all participants.

The instrument was validated by five experts who focused on measuring the Content Validity Index (CVI). This procedure yielded an overall coefficient of 0.95, confirming the representativeness and relevance of the items. These experts also provided qualitative

feedback that helped optimize the semantic clarity of the final scale.

Furthermore, the analysis of the survey responses allowed for the identification of key patterns and trends that enable an evaluation of how users perceive the effectiveness, accessibility, and usefulness of this technology. Additionally, to optimize the data analysis, an age-based classification was performed, which revealed differences in experience and satisfaction according to life stage. The groups were classified as follows:

- Adolescents: Students aged 17 or younger.
- Young people: Students between 18 and 29 years old.
- Adults: Students aged 30 or over.

In order to improve the efficiency of handling the questions, they were assigned the explicit notation shown in Table 1 below.

Table I. Question Notation

P1	How likely are you to recommend the use of generative AI for assessment to other colleagues?
P2	How satisfied are you with the feedback received after interacting with generative AI?
P3	How useful was the adaptive feedback provided by AI in improving your understanding of the content?
P4	How likely are you to prefer assessments using generative AI over traditional exams?
P5	How likely are you to experience less anxiety in future assessments performed with generative AI?
P6	How motivated do you feel to continue using this technology in other courses after your experience with generative AI?
P7	Did you feel more confident in your answers during the AI assessment than in traditional exams?
P8	Do you feel that the level of difficulty of the questions adapted to your performance was appropriate?
P9	How likely are you to consider generative AI as a tool that facilitates meaningful learning?
P10P11P12P13	How would you rate the ease of use of the generative AI platform during the evaluation?
	How desirable is it for you that future assessments include generative AI to personalize the experience?
	How satisfied are you with the personalization of questions offered by generative AI?
	Do you consider the feedback provided by the AI to have been fast and efficient?

The nature of the variables corresponding to the survey responses is ordinal. The values from 1 to 5 indicate an order of preference or rating, but not a uniform distance between consecutive categories. This characteristic limits the applicability of normality assumptions, since the data are not considered truly continuous, requiring an appropriate approach for their analysis.

Based on the survey questions, categories were defined that measure different dimensions related to the perception of satisfaction with generative artificial intelligence, which are:

- General perception: P1, P4, P9
- Perception feedback: P2, P3, P13
- Self-perception in relation to AI: P5, P6, P7
- Perception in rating: P8, P10
- Perception in personalization: P11, P12

Another procedure applied was the Kruskal-Wallis H test, a non-parametric test used to determine whether three or more independent data sets come from the same population. Unlike parametric tests, such as ANOVA, this test is based on ranks rather than means,

making it suitable when the samples do not follow a normal distribution. Essentially, it allows us to assess whether there are significant differences between the medians of the analyzed groups.

Finally, the Wilcoxon test was applied to compare two related measurements obtained from the same participants. This nonparametric test is especially useful when the data do not follow a normal distribution and when working with ordinal variables. Like the Kruskal-Wallis H test, it is based on ranks; however, it is specifically used when comparing two related conditions.

Results and Discussion

This section presents the findings obtained from the analysis of the collected data. First, it shows the average of the responses obtained to assess the experience; then, it outlines the sociodemographic attributes that allow us to identify the profile of AI users in this research context. Finally, it presents the results of the inferential analysis that reveals perceptions of satisfaction and experience with GenAI.

The data reveals a favorable perception of the usefulness and effectiveness of GenAI in the student context, which leads to the conclusion that the user experience is valued positively, a fact confirmed by the overall average of the responses obtained equal to 4.23.

Regarding the sociodemographic characteristics considered in this study, the students' gender influenced the average ratings given for satisfaction and experience using generative artificial intelligence. The majority of participants in the survey were male students, representing 79.41% of the sample, with an average rating of 4.3 for satisfaction and experience with GenAI. Female participation, on the other hand, reached 20.38%, with a slightly lower average rating of 4.1.

The “Other” category had only one participant (0.21%), so it is not possible to draw any conclusions about this group. Results by sex can be seen in Figure 2 below.

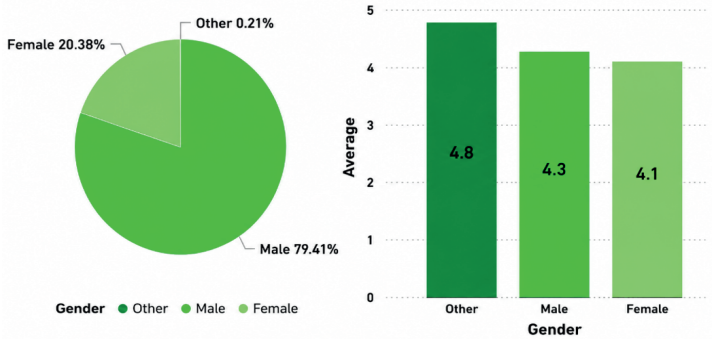

Figure 2. Respondents by sex

Based on the participants' ages, it can be said that the majority of respondents belong to the young adult group (18 to 29 years old). This result is consistent with the context in which the survey was conducted, since, being administered at a university, it is reasonable to expect that most participants would fall within this age range.

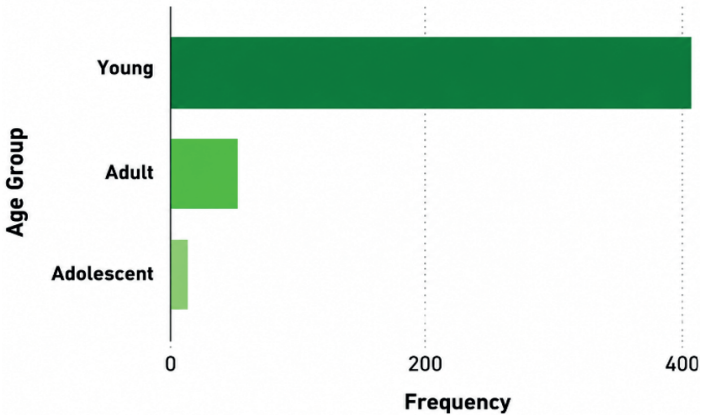

Figure 3. Respondents by age group

Finally, the marital status of the survey participants was analyzed. The results showed that the majority of participants were single, which is consistent with the demographic profile of university students. A smaller percentage of people were found to be in common-law relationships, while the "Married," "Other," and "Divorced" groups had the smallest representation in the sample, as shown in Figure 4.

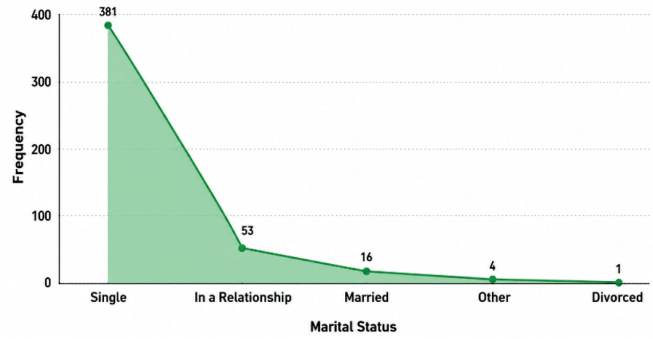

Figure 4. Respondents by marital status

To determine if there are significant differences in the perception of the students, the following hypotheses were defined.

H0: The data sets come from the same population (They have the same mean)
H1: The data sets come from different populations (They do not have the same mean)

Category 1

General perception on the use of GenAI for exam grading (Questions 1, 4 and 9).

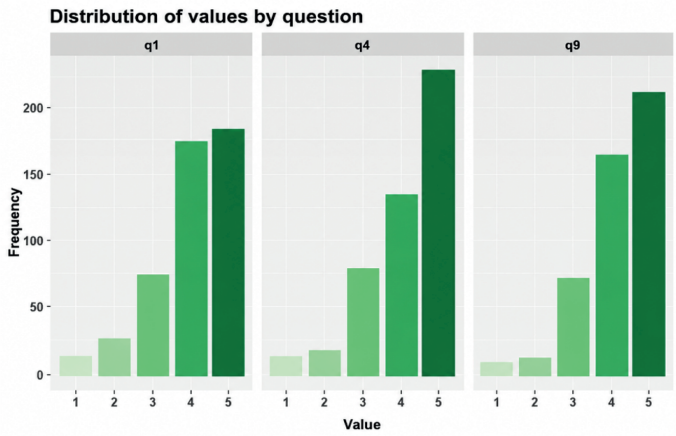

Figure 5. Distribution of values per question (1, 4, 9)

Kruskal-Wallis Test Results

Given a significance level $\alpha = 0.05$, and a p-value = 0.01122 obtained in the test, we can conclude that, since the p-value is less than α, the null hypothesis H0 is rejected. This means that there are statistically significant differences between the distributions of the analyzed groups.

Category 2

Perception associated with the performance of the feedback given by the generative AI (Questions P2, P3 and P13)

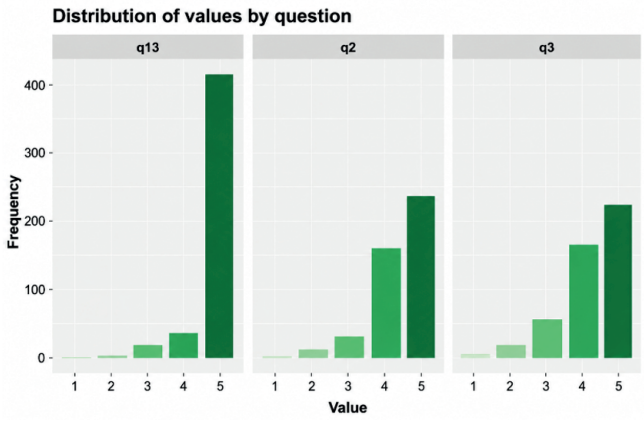

Figure 6. Distribution of values per question (2, 3, 13)

Given a significance level $\alpha = 0.05$, and a p-value = 2.2e-16 obtained in the test, we can conclude that, since the p-value is less than α, the null hypothesis H0 is rejected. This

means that there are statistically significant differences between the distributions of the analyzed groups.

Category 3

Own socio-emotional perception in relation to the use of AI for exam grading (P5, P6 and P7)

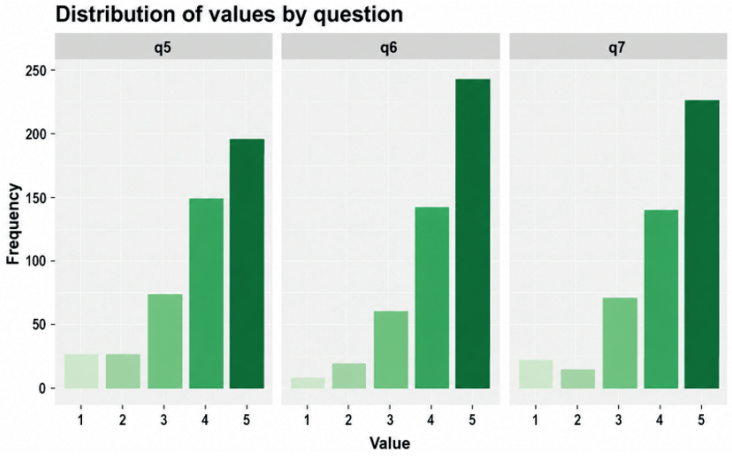

Figure 7. Distribution of values per question (5, 6, 7)

Given a significance level $\alpha = 0.05$, and a p-value = 0.002267 obtained in the test, we can conclude that, since the p-value is less than α, the null hypothesis H0 is rejected. This means that there are statistically significant differences between the distributions of the analyzed groups.

Category 4

Perception of the performance of the rating performed by the AI

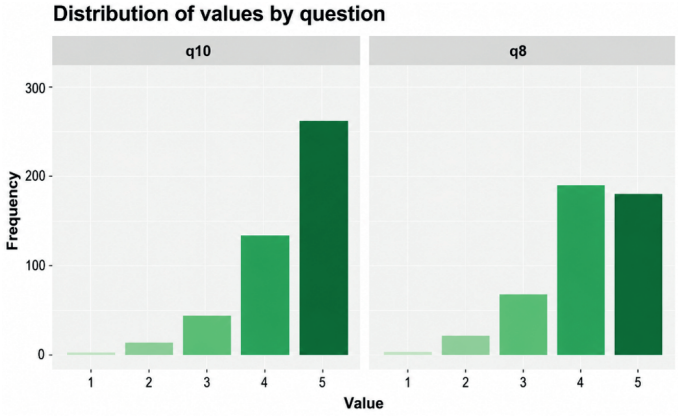

Figure 8. Perception of the AI-generated rating performance

Wilcoxon test

Given a significance level $\alpha = 0.05$, and a p-value = 8.768e-08 obtained in the test, we can conclude that, since the p-value is less than α, the null hypothesis H0 is rejected. This means that there are statistically significant differences between the distributions of the groups analyzed.

Category 5

Perception of AI performance in relation to personalization

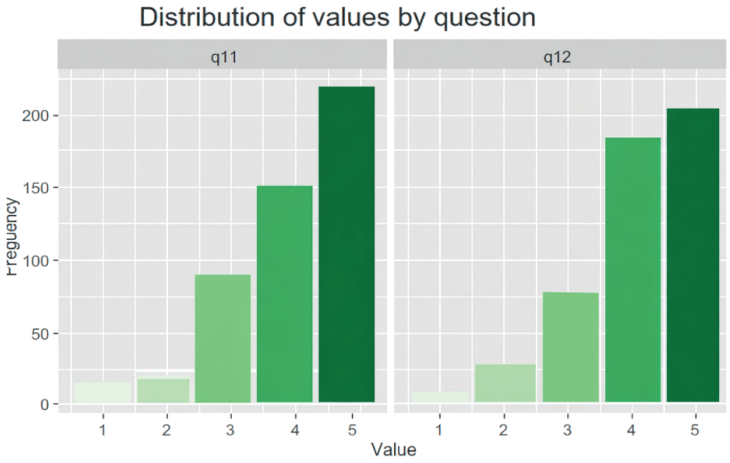

Figure 9. Perception of AI performance in relation to personalization

Given a significance level $\alpha = 0.05$, and a p-value = 0.9098 obtained in the test, we can conclude that, since the p-value is greater than α, the null hypothesis H0 is not rejected. This means that no statistically significant differences were found between the distributions of the analyzed groups.

Category 6

Overall perception of the test (Includes all questions)

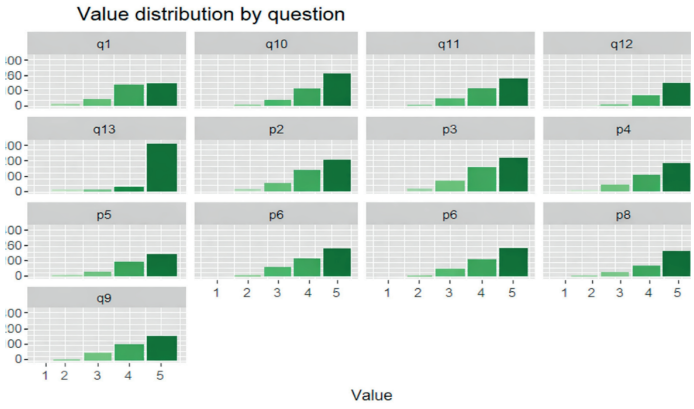

Figure 10. General perception of the test

The table below summarizes the average of all the questions asked in the survey

Table II. Average of the questions

P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
4.03	4.31	4.26	4.18	3.98	4.94	4.14	4.06	4.20	4.36	4.14	4.20	4.82

Given a significance level $\alpha = 0.05$, and a p-value = 2.2e-16 obtained in the test, we can conclude that, since the p-value is less than α, the null hypothesis H0 is rejected. This means that there are statistically significant differences between the distributions of the analyzed groups.

The high value in question P6 (4.94) suggests a high concentration of responses in the highest category. This result should be interpreted with caution, considering possible biases associated with the item's wording or social desirability.

The results of this study raise some crucial practical implications for university training processes. Firstly, the high level of overall satisfaction suggests integrating these tools into assessment, but obviously, this integration must be supported by adequate training for both faculty and students.

Likewise, the motivation towards the permanent use of technology indicates that universities should have a turning point; taking advantage of the students' willingness towards these tools, their inclusion should be considered systematically and in that sense, outline pedagogical strategies that integrate GenAI as recommended [15] in the context of the flipped classroom.

Finally, another substantial debate arises from this research, which concerns the high levels of dependence that GenAI users develop, especially students, who find in these tools the quickest way to complete their learning tasks without considering the effects that indiscriminate use has on their ability to genuinely solve problems, critical thinking, and many other essential skills for professional development. Given this reality, the

results suggest considering pedagogical strategies and practices that promote a more prudent and scrupulous use of GenAI.

Conclusions

The analysis reveals statistically significant differences in the distribution of responses, excluding the personalization dimension. It is also noteworthy that the questions asked measured specific dimensions related to user performance and perception of GenAI. These findings suggest a need for cautious interpretation of the results obtained in each dimension to achieve a more accurate understanding of the characteristics evaluated.

Participants indicated that the artificial intelligence performed well, a finding corroborated by the average ratings provided by these users. Specifically, the average score was 4.23, a rating that, as mentioned, reflects both a positive perception and efficient performance of the AI.

In summary, the results of this research indicate significant acceptance of AI-based tools in higher education, where they are frequently used to support learning tasks. Indeed, the users participating in this study perceive them as a resource with efficient performance.

However, despite the idea highlighted earlier, the responses obtained regarding the experience and fulfillment of expectations were quite diverse; that is, each user reported a particular experience, except for the personalization dimension, which did achieve very similar results that reveal that, in fact, the outputs generated by these tools are not individually adapted to the user's requirements.

These results serve as important reference frameworks to foster teaching practices that take as their central focus responsible and conscious training in technological matters, specifically in the use of GenAI with criteria and cognitive autonomy that prepares the student to discern about the answers they obtain from such tools and in that sense to forge a personal perspective that brings them closer to genuine learning.

On the other hand, it is necessary to mention some limitations of this study. First, the inability to generalize the results to other contexts, due to the nature of the sample, which was limited to engineering students from a single university in Colombia.

Furthermore, another limitation related to the research design is noted: its cross-sectional nature prevents the observation of changes or evolution in students' perceptions over time. This characteristic hinders the establishment of causal relationships between the variables.

This research presented other aspects that limited its scope and significance, which are mainly related to the lack of a control group that did not use AI. This attributes the satisfaction levels exclusively to the technological tool; furthermore, the nature of the

data collection instrument, geared towards self-assessment, could be subject to social desirability bias.

The limitations identified in this study underscore the need to replicate the research in broader contexts, that is, to include more universities and other fields of knowledge beyond engineering. Furthermore, these results highlight the value of considering longitudinal designs that would allow us to observe how student satisfaction with GenAI evolves as users experiment and learn.

Thanks

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