

Original article



## Artificial intelligence in the critical thinking of students of technological careers

**Inteligencia artificial en el pensamiento crítico de estudiantes de carreras tecnológicas**

**Inteligência artificial no pensamento crítico de estudantes de carreiras tecnológicas**

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### ABSTRACT

Artificial intelligence has become one of the most influential innovations in recent years, with applications that have transformed Higher Education. However, questions remain about how its use impacts the development of critical thinking among students pursuing technology-related careers. The purpose of this study was to examine the relationship between the use of artificial intelligence tools and the critical analysis skills of students at the Eloy Alfaro Lay University of Manabí. A quantitative correlational approach was applied, supported by the administration of structured questionnaires to a representative sample of the student population. The results show that the use of artificial intelligence contributes to strengthening skills related to logical reasoning, synthesis, and reflective analysis. It is also noted that its use is associated with improved performance in solving complex problems within the academic field. Taken together, these findings demonstrate that

artificial intelligence not only expands access to information but also constitutes a resource for enhancing more structured and analytical thought processes. It is suggested that future research advance the design of pedagogical strategies that critically and responsibly integrate these technologies, in order to consolidate broader intellectual competencies in students.

**Keywords:** artificial intelligence; critical thinking; higher education.

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## RESUMEN

La inteligencia artificial se ha convertido en una de las innovaciones más influyentes de los últimos años, con aplicaciones que han transformado la Educación Superior. No obstante, todavía existen dudas sobre la manera en que su uso repercute en el desarrollo del pensamiento crítico de los estudiantes de carreras tecnológicas. El presente estudio tuvo como propósito examinar la relación entre la utilización de herramientas de inteligencia artificial y la capacidad de análisis crítico de los estudiantes de la Universidad Laica Eloy Alfaro de Manabí. Se aplicó un enfoque cuantitativo de tipo correlacional, sustentado en la aplicación de cuestionarios estructurados a una muestra representativa de la población estudiantil. Los resultados permiten reconocer que el empleo de la inteligencia artificial contribuye al fortalecimiento de habilidades vinculadas con el razonamiento lógico, la capacidad de síntesis y el análisis reflexivo. Asimismo, se advierte que su uso se relaciona con un mejor desempeño en la resolución de problemas complejos dentro del ámbito académico. En conjunto, estos hallazgos evidencian que la inteligencia artificial no solo amplía el acceso a la información, sino que también constituye un recurso para potenciar procesos de pensamiento más estructurados y analíticos. Se sugiere que futuras investigaciones avancen en el diseño de estrategias pedagógicas que integren de manera crítica y responsable estas tecnologías, con el fin de consolidar competencias intelectuales de mayor alcance en los estudiantes.

**Palabras clave:** inteligencia artificial; pensamiento crítico; educación superior.

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## RESUMO

A inteligência artificial tornou-se uma das inovações mais influentes dos últimos anos, com aplicações que transformaram o Ensino Superior. No entanto, ainda existem dúvidas sobre como seu uso impacta o desenvolvimento do pensamento crítico entre estudantes que cursam cursos de tecnologia.

O objetivo deste estudo foi examinar a relação entre o uso de ferramentas de inteligência artificial e as habilidades de análise crítica de estudantes da Universidade Laica Eloy Alfaro de Manabí. Foi aplicada uma abordagem quantitativa correlacional, apoiada pela aplicação de questionários estruturados a uma amostra representativa da população estudantil. Os resultados mostram que o uso da inteligência artificial contribui para o fortalecimento de habilidades relacionadas ao raciocínio lógico, à síntese e à análise reflexiva. Observa-se também que seu uso está associado à melhoria do desempenho na resolução de problemas complexos no âmbito acadêmico. Em conjunto, esses achados demonstram que a inteligência artificial não apenas amplia o acesso à informação, mas também constitui um recurso para aprimorar processos de pensamento mais estruturados e analíticos. Sugere-se que pesquisas futuras avancem no desenvolvimento de estratégias pedagógicas que integrem essas tecnologias de forma crítica e responsável, com o objetivo de consolidar as competências intelectuais mais amplas dos estudantes.

**Palavras-chave:** inteligência artificial; pensamento crítico; ensino superior.

## INTRODUCTION

In recent years, artificial intelligence (AI) has taken on an increasingly important role in various fields, and education has been no exception. Its incorporation into teaching and learning processes has opened up new possibilities for accessing, analyzing, and processing information, facilitating personalized learning and optimizing academic tasks. However, its use in educational settings has generated intense debate about its impact on the development of critical thinking, a key competence in training professionals capable of facing the challenges of the 21st century. While some studies highlight that AI can strengthen analytical and decision-making skills, others warn that excessive or poorly regulated use could foster technological dependence and compromise students' cognitive autonomy (Nozato, 2024).

Beyond the educational field, the accelerated advancement of AI has raised concerns about its impact on society. According to Forbes magazine, two of the main fears associated with this technology are the reduction of job opportunities due to the automation of tasks and the concept of technological singularity, which poses the risk of AI surpassing human intelligence and making decisions autonomously, with potentially unpredictable consequences (Mosqueda, 2024). These concerns underscore the need for research that analyzes not only the role of AI in education, but also its

influence on the development of essential skills such as critical thinking, ensuring that its implementation contributes to the development of individuals with independent judgment and reasoning skills.

The study by Rodrigues and Dos Santos (2023) explored the use of ChatGPT and Bing Chat as tools to enhance learning in STEM disciplines. The results suggest that these platforms can foster reflective and critical thinking, as well as the understanding of complex concepts, by serving as "objects for thinking" within a constructivist framework. However, the study highlights the importance of integrating AI with collaborative learning activities and addressing concerns about the accuracy of the information provided by these tools.

Zaphir *et al.* (2024) proposed a framework for assessing the thinking quality of generative artificial intelligences. This framework enables educators to identify the vulnerability of their assessments to the use of AI, informing assessment design practices that promote critical thinking skills in students. The research emphasizes the need to understand the capabilities and limitations of AI in simulating cognitive skills to ensure academic integrity and fairness in assessments.

Incorporating artificial intelligence into the classroom can have a positive impact on student learning, as it is a tool with great potential to transform education. One way to engage it is through the use of virtual assistants. These assistants can help students complete specific tasks, answer questions, and provide real-time feedback. Using virtual assistants in the classroom can improve learning effectiveness, as well as student satisfaction and motivation (Rodríguez Almazán *et al.*, 2023).

The implementation of artificial intelligence (AI) in educational settings offers significant opportunities, but also faces various limitations and challenges that must be considered for effective and ethical integration.

- Digital divide and unequal access. As Vesna *et al.* (2025) point out, the adoption of AI-powered technologies can deepen inequalities, as students from disadvantaged backgrounds -with limited technological infrastructure, connectivity, and digital skills- face greater barriers to benefiting from these tools.
- Algorithmic biases and privacy. AI can perpetuate existing biases and raise concerns about student data privacy (Guzmán *et al.*, 2024).

- Lack of formal policies and teacher training. Despite the increasing use of AI-based tools, less than 10% of educational institutions have formal policies on the subject, underscoring the urgency of establishing clear frameworks.
- Technological dependence and the reduction of critical skills. According to Beneite (2023) overreliance on AI can lead to the reduction of critical skills in teachers and students.
- Ethical and transparency challenges. The implementation of AI in education raises ethical challenges related to the transparency of algorithms and accountability in automated decision-making (Gillani *et al.*, 2023).

Critical thinking is defined as a rational and reflective process aimed at making decisions about what to believe or how to act. This process involves skills such as interpretation, analysis, evaluation, and inference of information, as well as conscious self-regulation to ensure the quality of one's own thinking (López *et al.*, 2024). For Chunga *et al.* (2023), critical thinking is fundamental in education for cognitive development and the training of active citizens in today's society. Its promotion in classrooms aims to enable students to evaluate the validity of the information presented, analyze problems from different perspectives, and make decisions based on logical reasoning.

Within technological careers, critical thinking plays an essential role, as it not only facilitates the analysis and evaluation of information but also allows this knowledge to be applied in solving innovative problems. In a context where creativity and informed decision-making are essential, this skill is key to designing efficient, evidence-based solutions. Benavides and Ruíz (2022) point out that, in technical and scientific education, critical thinking fosters autonomy and improves the ability of future professionals to develop data-based responses.

In the case of technology programs, where problem-solving and information evaluation are essential, it is crucial to understand how the use of AI tools influences students' critical thinking. The Universidad Laica Eloy Alfaro de Manabí (ULEAM) has experienced an increase in the adoption of AI in the teaching-learning process, which raises the need to evaluate whether these tools are strengthening or weakening the analytical, argumentative, and problem-solving skills of future technology professionals.

The main objective of this research is to analyze the relationship between the use of artificial intelligence tools and the development of critical thinking among students of technology programs at ULEAM. To this end, the following general hypothesis is proposed:

- $H_0$  (Null Hypothesis): There is no significant relationship between the use of artificial intelligence tools and the development of critical thinking in students of technological careers at ULEAM.
- $H_1$  (Alternative Hypothesis): There is a significant relationship between the use of artificial intelligence tools and the development of critical thinking in students of technological careers at ULEAM.

Likewise, specific hypotheses are established that will allow us to evaluate the influence of frequency of use, the type of tools employed, and the perception of AI on cognitive autonomy and the development of critical thinking.

To answer these questions, a descriptive-correlational quantitative study was conducted with a cross-sectional design. The study population consisted of 697 technology students at ULEAM, and a representative sample of 248 participants was obtained through stratified probability sampling. A validated questionnaire with Likert scales was used to measure the use of AI and its impact on critical thinking. Data analysis was performed using JASP software, applying Spearman correlation tests, multiple linear regression, ANOVA, and chi-square tests, which allowed us to identify significant associations and differences between the variables studied.

This study seeks to contribute to the debate on the role of artificial intelligence in higher education and provide empirical evidence on its influence on the development of critical thinking in future technology professionals.

## **MATERIALS AND METHODS**

The methodology used in the study on the impact of artificial intelligence on the development of critical thinking among students of technology programs at the Technical and Technological Training Academic Unit of the Eloy Alfaro Lay University of Manabí (ULEAM) is detailed below.

This research is quantitative because it focuses on the collection and analysis of numerical data to describe phenomena and establish behavioral patterns. This approach is based on the positivist paradigm, which seeks objectivity and replicability in results. According to Mosteiro and Porto (2017), the positivist paradigm, also called quantitative or empirical-analytical, is dominant in some scientific communities and is linked to methodologies that emphasize measurement and statistical analysis.

A descriptive-correlational approach was adopted in this study. The descriptive approach allows for the examination of the characteristics of a population or phenomenon without modifying its behavior, while the correlational approach seeks to identify associations between two or more variables without establishing causal relationships. According to Ramos (2020) these methodologies are widely used in research aimed at understanding the dynamics and interactions within the educational field.

From a descriptive perspective, the profile of technology students was analyzed without intervening in their behavior. To this end, sociodemographic data such as age, gender, major, and academic level were collected to obtain a detailed view of the participants. In addition, the degree of exposure to and use of artificial intelligence tools in their academic training was examined, as well as their perceptions of the impact of these technologies on their analytical, evaluation, and problem-solving skills.

On the other hand, a correlational approach was used to explore the relationship between the frequency and manner in which students use artificial intelligence tools and the development of their critical thinking. To do so, correlations between the level of interaction with AI and participants' self-reported critical thinking skills were analyzed. Spearman's correlation coefficient was used to measure the intensity and direction of this relationship, considering key aspects such as analytical skills, information evaluation, and informed decision-making.

A cross-sectional design was used, collecting data at a single point in time. Data collection was conducted through structured surveys directed at students, with the aim of measuring their perceptions of the use of AI in their education and the development of critical thinking skills.

The questionnaire was used as the main instrument for data collection. According to Rodrigues (2023) it is conceived as an instrument designed within the framework of a research project developed based on specific objectives, specifically designed for this study, and composed of 25 items distributed in the following sections: Section A: sociodemographic data (age, gender, career, etc.); Section B: Use of artificial intelligence in learning; Section C: Impact on the development of critical thinking; Section D: Perception of AI tools; Section E: General perception.

The questionnaire was validated in two phases. The first was content validity: experts in education and technology reviewed the instrument to ensure that the items were representative and relevant. Based on the suggestions and recommendations obtained, the items were adjusted to improve the definition of the elements to be measured in the instrument (Flores & Terán, 2022). The second

phase was the pilot test: the questionnaire was administered to a sample of 30 students who were not part of the final sample. The data obtained were analyzed to calculate the internal consistency coefficient (Cronbach's  $\alpha$ ), obtaining a value of 0.87, indicating high reliability.

The target population consisted of 697 students enrolled in technological programs at the ULEAM Technical and Technological Training Academic Unit during the 2024-2025 academic period. Stratified probability sampling was used to ensure representativeness of the different programs. The final sample consisted of 248 students, calculated with a 95% confidence level and a 5% margin of error. A form was created in Microsoft Forms, which was shared via email, and completed and valid forms were validated. The collected data were exported to JASP software (Jeffrey's Amazing Statistics Program) for statistical analysis.

According to Villalobos (2022), educational research must be governed by fundamental ethical principles that guarantee the respect and protection of participants. Among these, scientific integrity stands out, understood as the conscious and consistent application of ethical values in the production and dissemination of knowledge. Likewise, it was essential to respect the participants' privacy, promoting transparency and trust in the research process. A key aspect of this research was the protection of personal data, in compliance with current regulations on privacy and information security. Adherence to these principles not only strengthened the ethical rigor of the study but also contributed to the well-being of the academic community and society as a whole.

## RESULTS

Once the data has been analyzed, the following results are presented (Table 1).

**Table 1.** Use of artificial intelligence

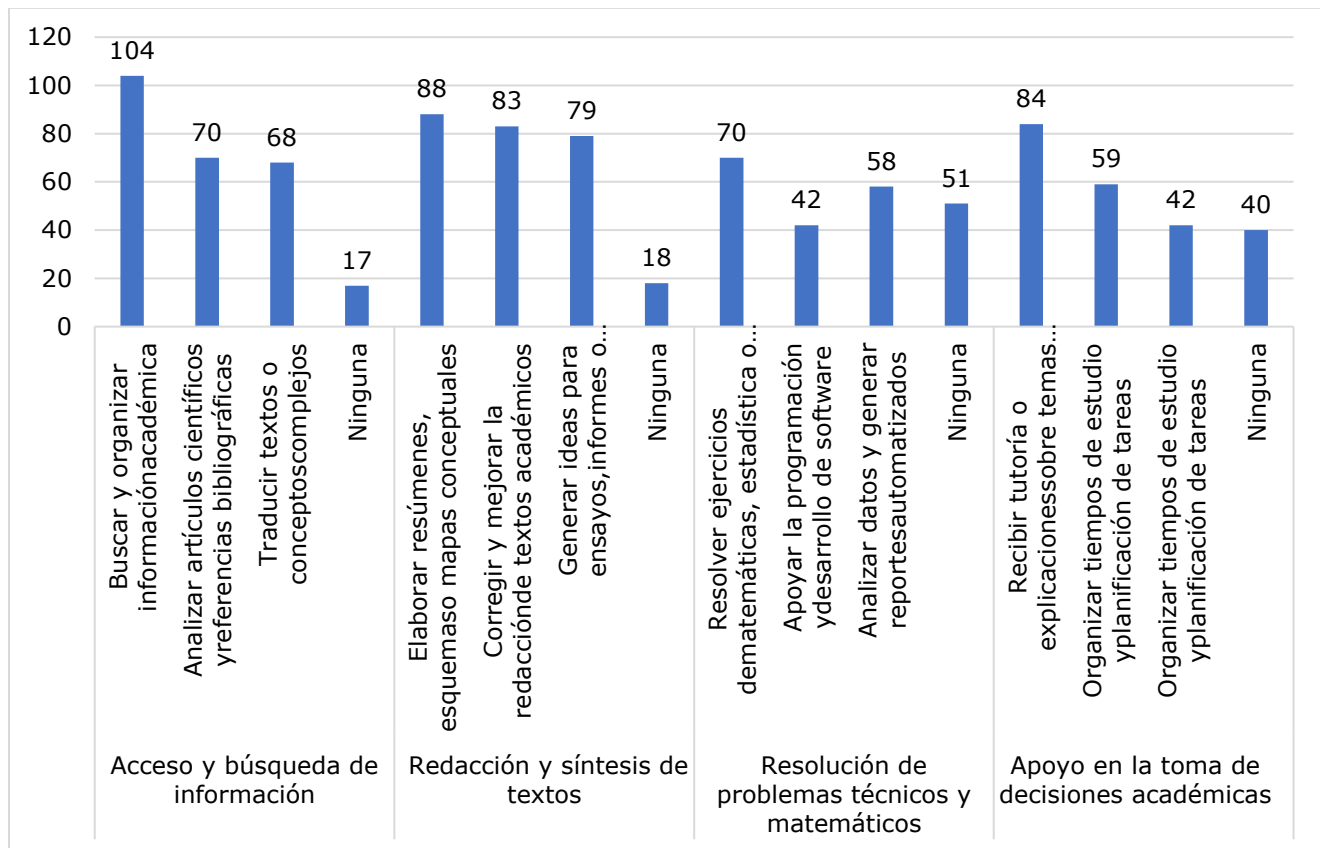
Variables	Never		Hardly ever		Sometimes		Frequently		Always	
	Fre.	%	Fre.	%	Fre.	%	Fre.	%	Fre.	%
Use for studies	21	8.47	60	24.19	87	35.08	47	18.95	33	13.31
Use to access information	5	2.02	1	0.40	96	38.71	70	28.23	76	30.65
Use to personalize learning	3	1.21	4	1.61	91	36.69	93	37.50	57	22.98
<b>TOTAL</b>	9.67	3.90	21.67	8.74	91.33	36.83	70.00	28.23	55.33	22.31

<https://mendive.upr.edu.cu/index.php/MendiveUPR/article/view/4225>

The study analyzes the use of artificial intelligence (AI) tools in three areas of learning: study, access to information, and personalization. In each dimension, trends are identified based on frequencies and percentages reported by students. Within the scope of the study, 35.08% of students use AI occasionally, 18.95% frequently, and 13.31% always. However, 32.66% use it little or not at all, highlighting barriers to its wider adoption.

Accessing information is the most common use: 38.71% use it sometimes, 28.23% frequently, and 30.65% always. Only 2.42% report no or almost no use, which positions AI as a key resource in the search for academic information. Regarding learning personalization, 36.69% use it sometimes, 37.50% frequently, and 22.98% always. Only 2.82% report minimal use, suggesting a high value of AI for adapting learning processes.

Overall, AI is used more intensively to personalize learning (60.48%) and access information (58.88%) than to support learning (32.26%). These results highlight the need to encourage more comprehensive use of AI, especially in activities that promote critical thinking (Figure 1).



**Figure 1.** Uses of AI

The illustration reflects how ULEAM technology students use artificial intelligence tools in their learning. Four main areas are identified: accessing and searching for information, writing and summarizing texts, solving technical and mathematical problems, and support in academic decision-making.

In the first category, the most frequent activity is searching for and organizing academic information (104 responses), followed by analyzing scientific articles and bibliographic references (70). Significant use is also observed in the translation of complex texts or concepts (68), indicating that AI facilitates access to and understanding of specialized information.

Regarding writing and summarizing texts, the creation of summaries, outlines and concept maps (88) and spelling correction and academic writing (83) stand out as key activities. In addition, the generation of ideas for essays and reports (79) shows that students turn to AI to organize and structure their writing.

Technical and mathematical problem-solving is another relevant area, with high use in mathematical and statistical exercises (70). AI is also used in programming and software development (42) and in data analysis and automated report generation (58 and 51, respectively).

Finally, in academic decision-making support, tutoring and explanation of topics (84) is the most frequently used function. Likewise, the organization of study materials (59) and the planning of tasks and study times (42 and 40) reflect the use of AI to improve academic management. These results suggest that AI not only optimizes learning but also strengthens critical thinking in students.

The results of the impact of artificial intelligence are shown below (Table 2).

**Table 2.** Impact of AI

Variables	Totally Disagree		Disagree		Neutral		Agree		Totally Agree	
	Fre.	%	Fre.	%	Fre.	%	Fre.	%	Fre.	%
Facilitates the identification of strong and weak arguments in academic texts	5	2.02	8	3.23	104	41.94	90	36.29	41	16.53
Promotes the validation of information through comparison with various sources	14	5.65	28	11.29	94	37.90	53	21.37	59	23.79
Facilitates the analysis of multiple perspectives on a topic	7	2.82	35	14.11	88	35.48	57	22.98	61	24.60
Improves the ability to justify responses	15	6.05	28	11.29	100	40.32	64	25.81	41	16.53
<b>TOTAL</b>	10.25	4.13	24.75	9.98	96.50	38.91	66.00	26.61	50.50	20.36

Analysis of the impact of artificial intelligence on the development of critical skills for information analysis and validation in students reveals significant trends.

First, regarding the identification of strong and weak arguments in academic texts, 36.29% of respondents believe that AI helps them in this process, while 16.53% strongly agree with this statement. However, 41.94% maintain a neutral stance, suggesting that many students do not yet perceive a clear impact or have not consciously used AI for this purpose.

Regarding the validation of information through comparison with various sources, 23.79% of students strongly agree that AI facilitates this process, and 21.37% also agree. However, 37.90% maintain a neutral position, and 16.94% disagree to varying degrees. This indicates that while some students recognize the usefulness of AI in verifying information, there is still a group that does not clearly identify this benefit.

Regarding the analysis of multiple perspectives on a topic, 24.60% of respondents strongly agree that AI contributes to this task, while 22.98% also agree. However, 35.48% maintain a neutral position and 16.93% disagree. These data suggest that, although AI can facilitate access to diverse perspectives, its use in this regard is not yet widespread among students.

Finally, regarding the ability to justify responses, 25.81% of respondents agree and 16.53% strongly agree that AI has a positive impact. However, 40.32% maintain a neutral stance and 17.34% disagree, suggesting that while AI offers tools to strengthen academic argumentation, its impact is not yet fully recognized or leveraged (Table 3).

**Table 3.** Perception of AI

Variables	Totally Disagree		Disagree		Neutral		Agree		Totally Agree	
	%	Fre.	%	Fre.	%	%	Fre.	%	Fre.	%
Strengthens the capacity for critical analysis	6	2.42	13	5.24	105	42.34	64	25.81	60	24.19
Improves logical reasoning	9	3.63	11	4.44	103	41.53	74	29.84	51	20.56
Develop more reflective and argumentative learning	6	2.42	20	8.06	111	44.76	69	27.82	42	16.94
Improves the ability to make informed decisions	14	5.65	38	15.32	95	38.31	42	16.94	59	23.79
AI creates dependency	26	10.48	42	16.94	104	41.94	41	16.53	35	14.11

The analysis of student perceptions shows that artificial intelligence (AI) is generally viewed as a tool with a positive impact on the development of critical thinking, although with nuances. Fifty percent of respondents agree or strongly agree that AI strengthens critical thinking, while 42.34% adopt a neutral stance. A similar pattern is observed in logical reasoning, with 50.40% in favor and 41.53% with a neutral perception.

Regarding reflective and argumentative learning, the results remain balanced: 44.76% expressed neutrality, and a similar percentage perceived benefits, revealing partial acceptance. Regarding

informed decision-making, 40.73% considered AI to contribute positively, although 38.31% remained neutral and 20.97% disagreed, suggesting greater diversity of opinions on this aspect.

Finally, regarding the potential dependence on AI, 30.64% acknowledge this possibility, compared to 27.42% who rule it out. The majority (41.94%) remains neutral, indicating that there is still no consolidated perception of this potential risk.

### Hypothesis testing: relationship between AI use and critical thinking development

Since both variables (AI use and perception of critical thinking) are ordinal, Spearman's correlation is the appropriate method to evaluate the relationship between them (Table 4).

**Table 4.** Spearman correlation

Variable	Correlation with "Strengthens my critical analysis skills"	p-value
Frequency of AI use in learning	0.295***	< 0.001
Using AI to assess the veracity of information	0.561***	< 0.001
Using AI to generate complex solutions	0.605***	< 0.001
Personalizing learning with AI	0.629***	< 0.001
AI encourages reflective and argumentative learning	0.725***	< 0.001
Frequent use of AI improves my logical reasoning	0.787***	< 0.001

Statistical analysis evaluated the relationship between the use of artificial intelligence (AI) tools and the development of critical thinking among students of technology programs at ULEAM, using Spearman's correlation test, appropriate for ordinal variables. Two hypotheses were tested: the null ( $H_0$ ), which denies the existence of a relationship, and the alternative ( $H_1$ ), which affirms it.

The results revealed positive and significant correlations in all cases ( $p < 0.001$ ), indicating that AI influences the development of critical thinking. The strongest relationship was between frequent AI use and logical reasoning ( $\rho = 0.787$ ), followed by reflective and argumentative learning ( $\rho = 0.725$ ).

Relevant correlations were also found in the evaluation of information veracity ( $\rho = 0.561$ ) and academic problem solving ( $\rho = 0.605$ ).

However, the lowest correlation was observed between frequency of AI use and overall critical thinking ( $\rho = 0.295$ ), suggesting that the impact of AI depends not only on its use, but also on how and in what contexts it is applied.

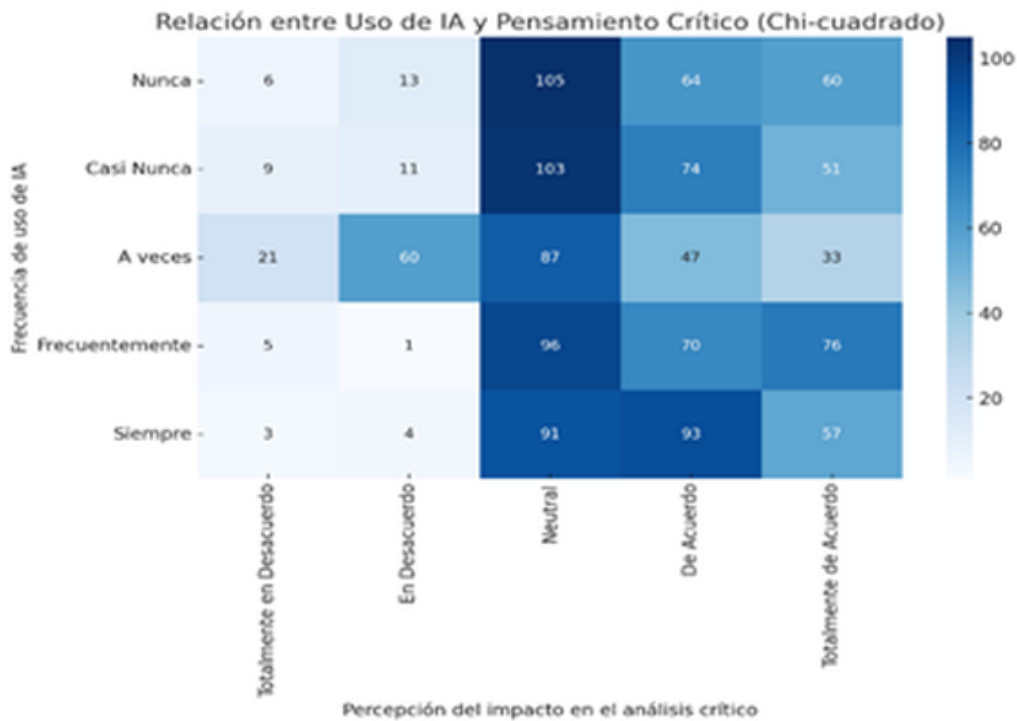
Based on these results, it can be concluded that there is a significant relationship between the use of artificial intelligence tools and the development of critical thinking in students. The statistical significance obtained in all correlations allows us to reject the null hypothesis ( $H_0$ ) and accept the alternative hypothesis ( $H_1$ ), confirming that the use of AI positively influences students' analytical skills, logical reasoning, and informed decision-making. These findings highlight the importance of integrating artificial intelligence into educational processes, not only as a tool for accessing information, but also as a resource for strengthening essential cognitive skills in the academic and professional fields.

### **Calculation and analysis of the chi-square test**

To examine the relationship between the use of artificial intelligence tools and the perception of their impact on critical thinking, a chi-square test of independence was applied. Two variables were assessed: the frequency with which students use AI in their learning (Never, Rarely, Sometimes, Frequently, Always) and their perception of whether these tools strengthen their critical thinking skills (Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree).

The results yielded a chi-square ( $\chi^2$ ) statistic of 189.64 with 16 degrees of freedom and a p-value less than 0.001, indicating a statistically significant relationship between the two variables. Consequently, the null hypothesis ( $H_0$ ) is rejected, confirming that the frequency of AI use is associated with the perception of its impact on the development of critical thinking.

When analyzing the frequencies, it was observed that students who use AI frequently or consistently tend to agree that these tools strengthen their critical analysis skills. In contrast, those who use it rarely or never show a more neutral or skeptical stance regarding its influence on learning (Figure 2).



**Figure 2.** Relationship between AI use and critical thinking

It is observed that as AI use increases (Frequently/Always), a higher proportion of students believe it strengthens their critical thinking (Agree/Strongly Agree). Students who never or rarely use AI tend to be in the Neutral or even Disagree category, suggesting that those who do not interact with these tools may not perceive their potential impact on critical analysis. These findings highlight the need to strategically integrate artificial intelligence into education, encouraging its use not only as a source of information, but as a resource that promotes analytical reasoning and critical evaluation. However, it is important to consider additional factors, such as the type of tools used and the way students interact with them, to better understand their impact on academic training.

## DISCUSSION

The results of this study confirm that the use of artificial intelligence tools is significantly related to the development of critical thinking in students of technological careers. The strongest correlation in this study was observed between the use of AI and the improvement of logical reasoning ( $\rho = 0.787$ ,  $p < 0.001$ ). These results are related to the study of Puche (2024) that through Spearman's correlation revealed a very significant correlation of 0.898, demonstrating a strong relationship

between artificial intelligence and critical thinking. The above suggests that these tools not only facilitate access to information, but also, can contribute to the development of analytical and structured processes, in accordance with the findings of Rojas *et al.* (2024), who perceive AI as a transformative tool that can improve efficiency in study and work, facilitate the understanding of complex subjects, and personalize education according to individual needs.

However, despite the identified positive impact, challenges have also been identified that require attention. A relevant finding is that the simple frequency of use of AI tools does not guarantee greater development of critical thinking ( $p = 0.295$ ,  $p < 0.001$ ). This result coincides with previous studies that have indicated that the impact of AI in education depends on the quality of its integration into the teaching-learning process (Oviedo, 2023). According to Martínez (2023), the indiscriminate abuse of artificial intelligence in university educational work could lead to greater student dependence or even the replacement of cognitive and analytical skills. This point is crucial, since the results of the present study reflect that 30.64% of respondents consider that AI could generate dependence, which suggests the need to regulate and guide its use in educational environments.

Given this scenario, future research could focus on exploring specific strategies for the effective integration of AI in Higher Education. In studies such as this one (Jácome, 2022) to maximize the potential of AI, it is crucial to integrate related content into the curriculum and promote critical skills such as critical thinking and adaptability. This research provides empirical evidence on the relationship between AI and critical thinking, but also opens the discussion on the need for institutional policies that regulate its use and promote pedagogical strategies that maximize its educational potential.

This study has demonstrated a significant relationship between the use of artificial intelligence tools and the development of critical thinking among students of technology programs at ULEAM. Statistical analyses show that the integration of AI into learning not only facilitates access to information but also strengthens key skills such as critical evaluation, logical reasoning, and reflective argumentation. These findings highlight the need to adopt pedagogical approaches that go beyond simple task automation, promoting a structured use of AI that stimulates active knowledge construction and analytical thinking.

The results indicate that students who frequently use AI tools exhibit significantly higher levels of critical thinking, with a particularly strong correlation in the development of logical reasoning.

However, the study also identifies challenges that must be addressed, such as the risk of technological dependence and the need for pedagogical strategies that guide its use in a critical and reflective manner. To optimize its impact, it is essential that educational institutions implement teacher training programs, integrate active learning methodologies, and establish policies that regulate the use of AI in the academic field, ensuring that its adoption enhances the development of autonomous cognitive skills and a deeper understanding of knowledge.

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### Conflict of interest

Authors declare no conflict of interests.

### Authors' contribution

The authors participated in the design and writing of the article, in the search and analysis of the information contained in the consulted bibliography.



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