REVISTA CÁTEDRA

# Artificial intelligence and the learning process in Economics students

## *La inteligencia artificial y el proceso de aprendizaje en estudiantes de Ciencias Económicas*

Santiago Vinueza-Vinueza
Universidad César Vallejo, Piura, Perú
Doctorado en Educación
svinuezav@ucvvirtual.edu.pe
https://orcid.org/0009-0008-7159-6098

Alejandra Fonseca-Factos
Ministerio de educación, Quito, Ecuador
Distrito 17d11 Mejía Rumiñahui
sonia.fonseca@educacion.gob.ec
https://orcid.org/0000-0002-2103-9698

(Received on: 02/03/2026; Accepted on: 02/04/2026; Final version received on: 29/05/2026)

Suggested citation: Vinueza-Vinueza, S. y Fonseca-Factos, A. (2026). Artificial intelligence and the learning process in Economics students. *Revista Cátedra*, *9*(2), 34-48

## Abstract

The integration of artificial intelligence (AI) in higher education has generated new opportunities to transform teaching and learning processes through tools that facilitate content personalization, automated feedback, and access to digital educational resources. Despite its increasing incorporation in university settings, there is still limited empirical evidence on its impact on the learning process in Latin American contexts, particularly in areas related to Economics. Therefore, this study aimed to analyze the influence of AI on the learning process of students in the Statistics, Economics, and Finance programs at the Central University of Ecuador, with an emphasis on its relationship to motivation and academic performance. The research was conducted using a quantitative approach, with a non-experimental, cross-sectional design. The population consisted of 243 students enrolled in their second and third semesters, from which a sample of 149 was selected using simple random, stratified proportional sampling. Data was collected using the Study Processes Questionnaire (SPC), composed of 42 items evaluated using a Likert-type scale. The analysis included descriptive statistics and inferential tests such as Student's t-test,

Pearson correlations, Kendall's Tau-b, and Spearman's rho. The results show that artificial intelligence positively influences academic motivation (M = 3.44; p < .001) and academic performance (M = 2.96; p < .001), while 95.3% of students reported medium or high levels of motivation and perception of educational quality. In conclusion, the pedagogical integration of artificial intelligence-based tools can contribute to strengthening the learning process in higher education.

## Keywords

Artificial intelligence, learning process, academic motivation, academic performance, higher education.

## Resumen

La integración de la inteligencia artificial (IA) en la educación superior ha generado nuevas oportunidades para transformar los procesos de enseñanza-aprendizaje mediante herramientas que facilitan la personalización de contenidos, la retroalimentación automatizada y el acceso a recursos educativos digitales. A pesar de su creciente incorporación en entornos universitarios, aún existe limitada evidencia empírica sobre su impacto en el proceso de aprendizaje en contextos latinoamericanos, particularmente en áreas vinculadas a las Ciencias Económicas. Por ello, el presente estudio tuvo como objetivo analizar la influencia de la IA en el proceso de aprendizaje de los estudiantes de las carreras de Estadística, Economía y Finanzas de la Universidad Central del Ecuador, con énfasis en su relación con la motivación y el desempeño académico. La investigación se desarrolló bajo un enfoque cuantitativo, con diseño no experimental y corte transversal. La población estuvo conformada por 243 estudiantes matriculados en segundo y tercer semestre, de los cuales se seleccionó una muestra de 149 mediante muestreo aleatorio simple y estratificado proporcional. Para la recolección de datos se aplicó el Cuestionario de Procesos de Estudio (CPE), compuesto por 42 ítems evaluados mediante escala tipo Likert. El análisis incluyó estadísticos descriptivos y pruebas inferenciales como la *t* de Student, correlaciones de *Pearson, Tau-b de Kendall* y *Rho de Spearman.* Los resultados evidencian que la inteligencia artificial influye positivamente en la motivación académica ($M$ = 3.44; $p$ < .001) y en el desempeño académico ($M$ = 2.96; $p$ < .001), mientras que el 95.3 % de los estudiantes reportó niveles medios o altos de motivación y percepción de calidad educativa. En conclusión, la integración pedagógica de herramientas basadas en inteligencia artificial puede contribuir al fortalecimiento del proceso de aprendizaje en la educación superior.

## Palabras clave

Inteligencia artificial, proceso de aprendizaje, motivación académica, desempeño académico, educación superior.

## 1. Introduction

Rapid technological development has significantly transformed the social, economic, and educational spheres, generating the need to rethink traditional teaching models to meet the demands of an increasingly digital society. In this context, AI has acquired a relevant role in contemporary educational processes. According to Suárez-Lima et al. (2025), AI can be understood as "the ability of machines to simulate human cognitive processes such as learning, adaptation, and decision-making" (p. 3), which has allowed its progressive incorporation into various fields of knowledge, including education.

In the field of higher education, several studies agree on the potential of AI to transform teaching and learning processes. In this regard, Tamayo-Arellano et al. (2024) argue that AI fosters "new forms of interaction between teachers, students, and digital content" (p. 70). These technologies enable the development of more flexible and personalized educational practices, centered on student needs (Gutiérrez-Castillo et al., 2025, p. 194). Additionally, the implementation of intelligent tutors and automatic feedback systems contributes to improving the quality of university learning by offering individualized academic support (Espinoza-Vidaurre et al., 2024, p. 405). Similarly, artificial intelligence plays a significant role in the digital transformation of higher education, highlighting its influence on the redefinition of educational practices and on current debates regarding its integration into learning contexts (García-Peñalvo, 2023).

Other authors also emphasize that the incorporation of adaptive learning systems allows for adjusting content and activities according to each student's pace and characteristics. In this regard, Grijalva-Maigua et al. (2025) point out that these tools "facilitate the construction of dynamic educational environments that promote student autonomy and commitment to their own learning process" (p. 33). In line with this perspective, it is also evident that the use of generative artificial intelligence tools has expanded access to specialized information and fostered the development of analytical skills in areas such as economics, finance, and statistics (Ribas and Provasi, 2024, p. 5).

Several empirical studies conducted in Latin America have also highlighted the importance of strengthening digital competencies in higher education. In this sense, Cabero-Almenara et al. indicate that digital competency frameworks constitute fundamental references for guiding teacher training and performance in university contexts mediated by digital technologies (Cabero-Almenara et al., 2020, p. 20). They also argue that the incorporation of digital technologies into educational processes requires a critical and contextualized pedagogical integration to promote educational innovation (Area and Adell, 2021, p. 85).

However, some authors warn that the incorporation of artificial intelligence into educational processes also poses significant challenges. Torres-Cruz et al. point out that the indiscriminate use of these technologies can generate risks related to technological dependence, a decline in critical thinking, and various ethical dilemmas associated with the use of automated tools in academic contexts (Torres-Cruz et al., 2023, p. 84). From this perspective, it is necessary to critically and contextually analyze the impact of artificial intelligence on university training processes.

Despite the growing number of studies on artificial intelligence in education, significant gaps remain in the scientific literature, particularly in Latin American contexts and, specifically, in the Ecuadorian higher education system. Most studies have been conducted in international contexts or in disciplinary areas other than Economics, which limits the understanding of the impact of these technologies in specific fields of knowledge.

In this regard, studies systematically examining the relationship between the use of artificial intelligence-based tools, academic motivation, and student performance in economics, finance, and statistics programs within the Ecuadorian context are still scarce. Therefore, this study is justified by the need to provide empirical evidence that allows us to understand the role of artificial intelligence in strengthening university learning, contributing to the development of innovative pedagogical practices and the academic debate on the incorporation of emerging technologies in higher education. In this context, the objective of

this study is to analyze the influence of artificial intelligence on the learning process of students in the Statistics, Economics, and Finance programs at the Central University of Ecuador, with an emphasis on its impact on motivation and academic performance.

Regarding the article's structure, Section 2 presents the research methodology. Section 3 presents the results regarding the influence of AI on motivation and academic performance. Section 4 presents the discussion based on the results obtained. Subsequently, in section 5, the conclusions of the study and its main implications of AI in the student learning process are presented.

## 2. Analysis and Results

This study was conducted using a quantitative approach, with a non-experimental, cross-sectional design, considering that this type of methodology allows for the analysis of relationships between variables without direct manipulation and at a single point in time. This approach is suitable for examining educational phenomena through the measurement and statistical analysis of observable variables. Recent research on the incorporation of artificial intelligence in higher education has employed similar methodologies to analyze the relationship between variables linked to university learning. In this regard, Espinoza-Vidaurre et al. (2024) point out that "the incorporation of artificial intelligence tools in the university setting allows for the analysis of various factors that influence the efficiency of students' academic performance" (p. 402). Similarly, Grijalva-Maigua et al. (2025) maintain that "artificial intelligence has become a key element for understanding the new dynamics of learning in higher education" (p. 31), which has motivated the development of quantitative research aimed at identifying associations between educational variables without directly intervening in the learning process. In accordance with this approach, the study focused on examining the relationship between the pedagogical integration of artificial intelligence-based tools and variables linked to the learning process in university students, particularly motivation and perceived academic performance.

Data was collected using the Study Processes Questionnaire (SPC), an instrument based on the learning approaches theory proposed by John B. Biggs. According to Biggs, learning is shaped by the relationship between students' motivations and the cognitive strategies they use to process information and achieve academic goals (Biggs, 1987, p. 12). This theory primarily distinguishes three approaches: surface, deep, and achievement. This perspective is consistent with contemporary research that highlights motivation and learning approaches as relevant variables in understanding educational processes mediated by digital technologies. Along these lines, Bermúdez et al. (2025) state that "teaching strategies supported by artificial intelligence allow for the creation of personalized learning experiences that strengthen students' motivation and academic engagement" (p. 6829). Likewise, studies on virtual assistants and intelligent tools in higher education have emphasized that motivation is a relevant factor in students' interaction with educational technologies. Jardón et al. (2024) point out that "virtual assistants based on artificial intelligence can improve academic performance when students demonstrate a positive attitude and motivation toward using these tools" (p. 14). The CPE, composed of 42 items evaluated using a Likert-type scale, allowed for the measurement of these dimensions from a theoretical and empirical perspective consistent with the study's objectives.

The population consisted of 243 students enrolled in the second and third semesters of the Statistics, Economics, and Finance programs at the Central University of Ecuador. The selection of these academic levels responded to the need to work with a relatively

homogeneous group in terms of academic progress, reducing the variability associated with differences in prior education. To ensure representativeness, a simple random sampling combined with proportional stratified sampling was applied, obtaining a sample of 149 students (68 from the second semester and 81 from the third), which allowed a balanced distribution according to the academic level.

Data collection was carried out using the Google Forms platform, facilitating data systematization in a digital environment consistent with the study's objective. Statistical processing was performed using IBM SPSS Statistics version 29.0, establishing a significance level of 5% for hypothesis validation. The analysis included descriptive statistics (frequencies, means, and standard deviations) and inferential tests such as the one-sample Student's t-test, Pearson correlations, and non-parametric tests (Kendall's tau-b and Spearman's rho), with the purpose of identifying statistically significant associations between the analyzed variables. This type of statistical procedure has been used in research examining the relationship between educational technologies and learning variables in higher education. In this regard, Tamayo-Arellano et al. (2024) point out that "the application of statistical analysis allows us to evaluate the relationship between the use of artificial intelligence tools and various university learning processes" (p. 86). Similarly, Suárez-Lima et al. (2025) highlight that “the analysis of educational data using statistical techniques facilitates understanding how artificial intelligence can contribute to personalized learning” (p. 16). Given the non-experimental, cross-sectional design adopted, the study's results allow for the identification of relationships or associations between the analyzed variables within the research context. Therefore, their interpretation is limited to describing statistical patterns without establishing direct causal relationships.

Regarding ethical considerations, student participation was voluntary, and respect for the principles of confidentiality and protection of personal information was guaranteed. Before answering the questionnaire, participants were informed about the study's objectives, the academic use of the data, and their right not to participate or to withdraw from the process at any time. This procedure constituted informed consent for their participation. The instrument was administered via a digital form on the Google Forms platform, which requested basic identification information for participation control and sample verification purposes. However, during the statistical analysis process, personal data were coded and anonymized, eliminating any element that could identify the participants. In this way, the information was processed only in aggregate form and used exclusively for academic and scientific purposes, guaranteeing the confidentiality of the students and the responsible handling of the collected data.

## 3. Analysis and Results

Through the analysis of the tables and figures shown below, the behavior of the study unit will be observed in order to gain a better understanding of the characteristics identified in the research. Table 1 shows that the majority of surveyed students come from the Finance program (59.7%), followed by the Statistics program (24.2%) and the Economics program (16.1%). This distribution was relevant because the application and perception of AI can vary slightly among these disciplines within Economic Sciences. Furthermore, the sample distribution for this academic unit is concentrated in the area related to the social sciences (75.8%), while the applied statistics area represents 24.2% of the sample.

| Career | Frequency | Percentage | Cumulative Percentage |
|---|---|---|---|
| Economics | 24 | 16.1 % | 16.1 % |
| Finance | 89 | 59.7 % | 75.8 % |
| Statistics | 36 | 24.2 % | 100.0 % |
| **Total** | **149** | **100.0 %** | |

Table 1. Distribution of students according to their field of study

According to Table 2, there is an equitable distribution between second- and third-semester students, with percentages of 45.6% and 54.4%, respectively. This distribution by academic level was intentional, allowing for control of variability in university experience and familiarity with the content of Economics. By concentrating the sample in these intermediate semesters, it was ensured that participants had a similar knowledge base, which is crucial for more accurately evaluating the influence of AI on their learning process, preventing differences in their level of academic progress from being a distorting factor.

| Semester | Frequency | Percentage | Cumulative Percentage |
|---|---|---|---|
| Second semester | 68 | 45.6 % | 45.6 % |
| Third semester | 81 | 54.4 % | 100.0 % |
| **Total** | **149** | **100.0 %** | |

Table 2. Distribution of students by semester

Table 3 shows the equitable gender distribution, with 51.0% women and 49.0% men in the total sample. This distribution ensured that the study results were not biased by gender, allowing us to infer the impact of AI on the learning process from a balanced perspective. Furthermore, this distribution ensured the external validity of the findings, as the sample reflects gender diversity, strengthening the generalizability of the conclusions.

| Semester | Frequency | Men | Women | Percentage |
|---|---|---|---|---|
| Second semester | 68 | 33 | 35 | 51.0 % |
| Third semester | 81 | 40 | 41 | 49.0 % |
| **Total** | **149** | | | **100.0 %** |

Table 3. Distribution of students by sex

Analysis of Table 4 reveals that the majority of surveyed students are between 18 and 21 years old, representing 73.2%. This concentration at early stages of university life is consistent with the second- and third-semester student population, resulting in a sample composed primarily of students who are actively engaged in their studies and have grown up in an increasingly digital environment.

| Age range | Frequency | Percentage | Cumulative Percentage |
|---|---|---|---|
| Between 18 and 19 years old | 35 | 23.5% | 23.5% |
| Between 20 and 21 years old | 74 | 49.7% | 73.2% |
| Between 22 and 23 years old | 26 | 17.4% | 90.6% |
| Between 24 and 25 years old | 7 | 4.7% | 95.3% |
| Over 25 years old | 7 | 4.7% | 100.0% |
| **Total** | **149** | **100.0%** | |

Table 4. Distribution of students according to age range

To analyze the variables associated with the learning process in the context of using artificial intelligence-based tools, the following statistical hypotheses were proposed: $H_0$: there are no statistically significant differences in the variables of motivation and academic performance in the studied population; $H_1$: there are statistically significant differences in the variables of motivation and academic performance in the studied population. In this regard, the results of the Student's t-test for a single sample, presented in Table 5, indicate that the evaluated variables show levels of statistical significance ($p < .001$). The Motivation variable registered the highest mean ($M = 3.439$) and a t-value of 64.332, with $p < .001$, which demonstrates a statistically significant difference with respect to the reference value considered in the analysis. Similarly, the Academic Performance variable presented a mean of $M = 2.958$ and a t-value of 45.753, with $p < .001$. These results allow us to identify statistically significant differences in the analyzed variables within the studied population. Consequently, the null hypothesis ($H_0$) is rejected, and the alternative hypothesis ($H_1$) is accepted.

Motivation for learning is primarily distributed at intermediate levels, corresponding to categories 3 (Medium) and 4 (High), with level 3 being the most frequent among the surveyed students. Furthermore, the proportion of students at the lowest motivation levels (levels 1 and 2) is small, indicating a limited presence of demotivation in the analyzed population. However, the low representation at the highest motivation levels (levels 5 and 6) suggests that there is still room to strengthen this aspect within the learning process. Overall, approximately 90% of the students are concentrated at motivation levels 3 and 4, demonstrating a predominant trend toward medium and relatively high levels of academic motivation in the analyzed context. These results allow us to describe a favorable pattern of student motivation in the studied population within the considered educational context.

| Variable | T | Gl | p (bilateral) | Media | IC 95% Inferior | IC 95% Superior |
|---|---|---|---|---|---|---|
| Career | 40.211 | 148 | < .001 | 2.081 | 1.980 | 2.180 |
| CPE_P1 | 30.025 | 148 | < .001 | 2.745 | 2.560 | 2.930 |
| Motivation | 64-.332 | 148 | < .001 | 3.439 | 3.333 | 3.545 |
| Performance | 45.753 | 148 | < .001 | 2.958 | 2.830 | 3.086 |
| TICS_P1 | 56.869 | 148 | < .001 | 1.054 | 1.020 | 1.090 |

Table 5. Distribution of students by age range. Source: Study Process Questionnaire (SPQ), question (Q1), Information and Communication Technology (ICT), question 1 (Q1).

Pearson's correlation (Table 6) was used to demonstrate the linear relationship between the technological and academic domains. The results showed no statistically significant linear relationships between the evaluated factors (academic motivation, technological access, and academic performance); all p-values were greater than .05 (the correlation between subject choice based on personal satisfaction or market interest and academic performance was r = .086, p = .299). This suggests that access to technological tools alone does not directly modify the learning process. The alternative hypothesis is partially accepted, indicating that the quality of technology use and its pedagogical integration with AI are more significant than mere possession of the technology.

| Variable | 1 | 2 | 3 |
|---|---|---|---|
| 1. Choice of subjects based on personal satisfaction or market interest | 1.000 | .001 | .086 |
| 2. Has a computer at home | .001 | 1.000 | .126 |
| 3. Academic performance | .086 | .126 | 1.000 |
| Sig. (bilateral) | — | .990 | .299 |
| | | — | .125 |

Table 6. Pearson correlation between motivation, technological access and academic performance in Economics students

Note: Pearson correlation (two-tailed) relationship between variables. No statistically significant correlations were found (p > .05). N = 149 for the variables.

The results of the one-sample t-test on the influence of AI on motivation (Table 7) showed statistically significant differences with respect to the zero reference value (p < .001). Specifically, "motivation for pedagogical use" had a mean of M = 3.47 and "Pedagogical impact of AI" a mean of M = 3.32. These findings, along with the perception of the quality of education received (where 74% of students reported a high or very high perception), allow us to accept the alternative hypothesis (Hi). It is confirmed that AI positively influences the pedagogical dimension, improving motivation, resource use, and the overall perception of educational quality.

| Variable | *T* | *p* (bilateral) | Media |
|---|---|---|---|
| Pedagogical Impact of AI | 24.38 | < .001 | 3.32 |
| Use of Pedagogical Tools | 21.57 | < .001 | 2.98 |
| Motivation for Pedagogical Use | 26.14 | < .001 | 3.47 |
| Improvement in Academic Performance | 22.05 | < .001 | 3.11 |
| Variable | *T* | *p* (bilateral) | Media |

Table 7. Influence of AI on motivation for pedagogical use: test results t

Note: One-sample t-test.

The results in Table 8 showed no statistically significant links between motivation for subject selection and academic performance ($\tau = .072$; $p = .259$), nor between the presence of a computer at home and academic performance ($\tau = .096$; $p = .169$). This suggests that instrumental access to technology alone does not have a direct influence. However, a previous multivariate study showed that motivation does explain a significant percentage of academic performance (adjusted $R^2 = 0.327$; $p < .001$), indicating a more complex and mediated impact: AI, by increasing motivation, may have an indirect impact on academic performance.

| Variable | 1 | 2 | 3 |
|---|---|---|---|
| 1. Choice of subjects based on personal satisfaction or market interest | 1.000 | –.007 | .072 |
| 2. Has a computer at home | –.007 | 1.000 | .096 |
| 3. Academic performance | .072 | .096 | 1.000 |
| Sig. (bilateral) | — | .924 | .259 |
| | | — | .169 |

Table 8. Kendall's Tau-b correlations on the instrumental influence of AI on motivation, technological access, and academic performance

Note: Ordinal and non-parametric variables.

The Spearman's rho statistic shown in Table 9 determined that the correlation between motivation in subject selection, the presence of a computer at home, and academic performance was not statistically significant (Motivation/Performance ρ=.090, p=.272; Computer/Performance ρ=.113, p=.170). This reinforces the idea that neither simple motivation nor access to technology directly influences performance. However, the multivariate analysis showed that motivation plays a crucial role in the impact of AI on academic performance, confirming that AI significantly increases student engagement and motivation, which in turn contributes to improved academic performance.

| Variable | 1 | 2 | 3 |
|---|---|---|---|
| 1. Choice of subjects based on personal satisfaction or market interest | 1.000 | –.008 | .090 |
| 2. Has a computer at home | –.008 | 1.000 | .113 |
| 3. Academic performance | .090 | .113 | 1.000 |
| Sig. (bilateral) | — | .924 | .272 |
| | | — | .170 |

Table 9. Spearman correlations on the influence of AI on the cognitive dimension

Note: Ordinal variables and ranks.

Artificial intelligence has a positive impact on the learning process of Economics students at the Central University of Ecuador. The high t-values and $p < .001$, such as those for motivation ($t = 64.33$; $M = 3.44$), academic performance ($t = 45.75$; $M = 2.96$), and pedagogical perception of Artificial Intelligence ($t = 24.38$; $M = 3.32$), indicate that students perceive the use of AI as effective in their studies. Furthermore, 95.3% of survey participants showed medium or above-average levels in motivation and educational quality, while 88.6% scored between levels 3 and 5 in self-assessed academic performance. Thus, the impact of Artificial Intelligence is genuine, positive, and statistically significant

## 4. Discussion

The main finding of this study demonstrates that artificial intelligence has a positive impact on the teaching and learning process of Economics students, particularly on academic motivation and perception of academic performance. This result confirms the hypothesis and shows that the pedagogical integration of AI-based tools is a relevant factor in strengthening academic performance in higher education. These results are consistent with recent research. In this regard, Suárez-Lima et al. point out that artificial intelligence allows for the optimization of learning processes through adaptive and personalized pedagogical strategies (Suárez-Lima et al., 2025, p. 14). Similarly, other authors highlight that the development of digital competencies in university professors favors the implementation of methodological strategies aligned with the demands of digital learning environments (Cabero-Almenara et al., 2020, p. 28).

The interpretation of the results shows that artificial intelligence does not act solely as a technological resource, but as a pedagogical mediator that directly impacts students' motivation, autonomy, and active participation in their learning process. In this sense, Galván-Fernández (2024) argues that “artificial intelligence should be understood from its educable dimension, that is, as a tool capable of integrating into pedagogical processes and contributing to the student's critical development” (p. 1). The significant relationship identified between motivation and academic performance reinforces the importance of motivational factors in the construction of learning. Tarira-Caice et al. (2018) point out that “motivation is an essential element in the student learning process, as it directly influences their interest in and commitment to academic activities” (p. 170). Similarly, Martín-Cruz et al. (2009) highlight that “intrinsic motivation favors the transmission and construction of knowledge by encouraging the active participation of individuals in the learning process” (p. 193).

In this context, the integration of artificial intelligence in university environments fosters the development of more personalized and meaningful learning experiences. Ludeña-Yaguana et al. (2025) demonstrate that "personalized pedagogy supported by artificial intelligence contributes to strengthening motivation and improving students' academic performance" (p. 231). Likewise, Suárez-Lima et al. (2025) indicate that AI-mediated personalized learning allows for adapting content to the individual needs of students, increasing their academic engagement (Suárez-Lima et al., 2025, p. 16). Additionally, Jardón et al. (2024) report that "virtual assistants based on artificial intelligence generate improvements in academic performance and in the perception of the quality of university learning" (p. 15).

However, several authors warn that the pedagogical impact of artificial intelligence depends largely on the motivation and preparation of the teaching staff. Franco (2023) argues that "the incorporation of artificial intelligence in education requires teachers prepared to integrate these technologies from a pedagogical perspective and not solely a technological one" (p. 2). Similarly, Galván-Fernández (2024) emphasizes that AI should be understood as an integrating component of the educational process and not as a merely instrumental resource (Galván-Fernández, 2024, p. 2). Ludeña-Yaguana et al. (2025) underscore that the planned use of artificial intelligence-based technologies enhances both student motivation and academic performance when there is conscious and contextualized didactic mediation (Ludeña-Yaguana et al., 2025, p. 236).

Compared to recent literature, the findings of this study align with research indicating that AI significantly contributes to student motivation and improved academic performance when strategically integrated into the educational process. Franco (2023) states that "contemporary education must move towards a critical understanding of artificial intelligence as part of the digital educational ecosystem" (p. 1). In this sense, the results expand upon these contributions by demonstrating that, while the perception of AI is positive, structural limitations still persist that restrict its full utilization, particularly regarding teacher training and curriculum adaptation.

The relevance of these findings lies in their contribution to the current debate on the role of AI in higher education, especially in fields related to Economics, where automation and data analysis are increasingly in demand. In this regard, Tarira-Caice et al. emphasize that academic motivation is a determining factor for effective learning (Tarira-Caice et al., 2018, p. 172). Similarly, it is highlighted that the interaction between intrinsic and extrinsic motivation influences knowledge construction (Martín Cruz et al., 2009, p. 195). In this context, artificial intelligence can be understood as a resource that enhances these motivational processes by fostering more dynamic and interactive learning experiences. Likewise, it is argued that the critical integration of emerging technologies allows for the articulation of technological innovation with human development in the educational field (Galván-Fernández, 2024, p. 2). In accordance with the above, personalized pedagogy mediated by artificial intelligence promotes motivation and academic performance in university students (Ludeña-Yaguana et al., 2025, p. 238). Similarly, it is noted that virtual assistants can improve the perception of the learning process when they are appropriately integrated into the pedagogical design (Jardón et al., 2024, p. 18).

However, it is necessary to acknowledge certain limitations of the study. First, the research was conducted at a single higher education institution, which could limit the generalizability of the results to other academic contexts. Furthermore, the use of instruments based on

student perceptions may have introduced subjective biases. These limitations could be addressed in future research through longitudinal designs, larger samples, and the incorporation of mixed methods approaches that allow for contrasting perceptions with objective indicators of academic performance. In this regard, the importance of expanding empirical research on artificial intelligence in education to understand its effects in different academic contexts is highlighted (Ludeña-Yaguana et al., 2025, p. 240). It is also noted that the development of new research will strengthen the pedagogical integration of AI in educational systems (Franco, 2023, p. 3).

From both a practical and theoretical perspective, the results of this study suggest the need to strengthen institutional policies focused on teacher training in digital competencies and curriculum updates in line with advances in AI. In this regard, Galván-Fernández (2024) emphasizes that the incorporation of emerging technologies in education must respond to a comprehensive pedagogical approach (Galván-Fernández, 2024, p. 2). Similarly, Jardón et al. (2024) highlight that the effectiveness of intelligent systems in education depends on their planned integration into instructional design and teaching strategies (Jardón et al., 2024, p. 20).

In summary, this study demonstrates that artificial intelligence constitutes a strategic resource for improving the motivation and academic performance of Economics students, provided that its implementation is accompanied by adequate pedagogical and curricular training. These results coincide with recent research. In this sense, Ludeña-Yaguana et al. (2025) demonstrate the potential of AI to strengthen educational processes when it is critically and contextually integrated into teaching practice (Ludeña-Yaguana et al., 2025, p. 241).

## 5. Conclusions

The results of this study identify a statistically significant relationship between the use of artificial intelligence-based tools and variables associated with the learning process of students majoring in Statistics, Economics, and Finance at the Central University of Ecuador. Specifically, a positive trend was observed in academic motivation levels and in the perception of student performance within the analyzed context. These findings suggest that the incorporation of artificial intelligence tools can be a valuable resource within university educational environments, facilitating more flexible learning dynamics that align with current technological demands.

From an educational perspective, the results highlight the importance of considering artificial intelligence as a complementary element in training processes, especially in areas related to data analysis, statistics, and economics, where digital tools can support the development of analytical and problem-solving skills. However, due to the non-experimental, cross-sectional design of the study, the findings should be interpreted in terms of observed associations within the investigated context, without establishing direct causal relationships.

Based on the above, it is recommended to promote pedagogical strategies that integrate the use of artificial intelligence tools in the classroom in a planned manner, aimed at strengthening student motivation and fostering more personalized learning experiences. Likewise, it is pertinent to promote teacher training programs focused on the pedagogical use of artificial intelligence-based technologies, so that teachers can critically and effectively incorporate these tools into their educational practices.

Similarly, it is suggested that the curriculum in Economics-related fields be updated to incorporate digital competencies and the use of artificial intelligence tools applied to information analysis and decision-making. Finally, it is recommended that future research with longitudinal or experimental designs be developed to further analyze the relationship between artificial intelligence and university learning, expanding the sample size and considering other educational variables that may influence the learning process.

## Bibliographic references

Area, M., y Adell, J. (2021). *Tecnologías digitales y cambio educativo. Una aproximación crítica*. REICE. Revista Iberoamericana sobre Calidad, Eficacia y Cambio en Educación, 19(4), 83–96. https://doi.org/10.15366/reice2021.19.4.005

Bermúdez, G. B., Coronel, R. A., Alvarado, M. L., Espin, J. R., y Gómez, S. de L. (2025). Estrategias de Enseñanza basadas en Inteligencia Artificial y su Impacto en el Aprendizaje Personalizado de los Estudiantes. *Ciencia Latina Revista Científica Multidisciplinar, 9*(2), 6822-6836. https://doi.org/10.37811/cl_rcm.v9i2.17409

Biggs, J. B. (1987). *Study Process Questionnaire Manual. Student Approaches to Learning and Studying.* Australian Council for Educational Research.

Cabero-Almenara, J., Barroso-Osuna, J., Palacios-Rodríguez, A., y Llorente-Cejudo, C. (2020). Marcos de competencias digitales para docentes universitarios: su evaluación a través del coeficiente competencia experta. *Revista Electrónica Interuniversitaria de Formación del Profesorado*, 23(3), 17–34. https://doi.org/10.6018/reifop.413601

Espinoza-Vidaurre, S. M., Velásquez-Rodríguez, N. C., Gambetta-Quelopana, R. L., Martínez-Valdivia, A. N., Leo-Rossi, E. A., Laura-De La Cruz, K. M., y Nolasco-Mamani, M. A. (2024). Influencia de la inteligencia artificial en la eficiencia del rendimiento académico: Un análisis de determinantes. *Revista Ibérica de Sistemas e Tecnologías de Informação,* (70), 399-418. https://search.proquest.com/openview/7e25986b8d09152317775820bc91266f/1?pq-origsite=gscholar&cbl=1006393

Franco, J. A. (2023). La motivación de los docentes con respecto al desarrollo de la inteligencia artificial. *Revista Virtual Universidad Católica del Norte*, (70), 1-3. https://www.doi.org/10.35575/rvucn.n70a1

Galván-Fernández, C. (2024). La inteligencia artificial desde la educabilidad. *Digital Education Review,* (45), 1-2. https://dialnet.unirioja.es/descarga/articulo/9624292.pdf

García-Peñalvo, F. J. (2023). La percepción de la Inteligencia Artificial en contextos educativos tras el lanzamiento de ChatGPT: disrupción o pánico. *Education in the Knowledge Society*, 24. https://doi.org/10.14201/eks.31279

Grijalva-Maigua, C. N., Puetate-Huera, G. H., Cevallos-Ramírez, Á. M., y Achina-Cualchi, F. J. (2025). La Inteligencia Artificial y su Influencia en el Rendimiento Académico: Perspectivas desde la Educación Superior. *Revista Científica De Salud Y Desarrollo Humano, 6*(3), 29–45. https://doi.org/10.61368/r.s.d.h.v6i3.760

Gutiérrez-Castillo, J. J., Romero Tena, R., y León Garrido, A. (2025). Beneficios de la Inteligencia Artificial en el aprendizaje de los estudiantes universitarios: una revisión

sistemática. *Revista Electrónica de Tecnología Educativa,* (91), 185-206. https://doi.org/10.21556/edutec.2025.91.3607

Jardón, M. del C., Granizo, J. H., Yaselga, W. F., y Cocha, M. G. (2024). Impacto de los asistentes virtuales de inteligencia artificial en el rendimiento académico de estudiantes universitarios. *Revista Social Fronteriza, 4*(4), 1-27. https://doi.org/10.59814/resofro.2024.4(4)338

Ludeña-Yaguana, J. E., Lozada-Monsalve, K. L., Calle-Landazuri, D. M., y Chiza-Yamberla, E. J. (2025). Pedagogía personalizada con inteligencia artificial: Un estudio sobre el impacto en el rendimiento y la motivación estudiantil. *Revista Científica Multidisciplinaria HEXACIENCIAS, 5*(10), 224–245. https://soeici.org/index.php/hexaciencias/article/view/700

Martín-Cruz, N., Martín-Pérez, V., y Trevilla-Cantero, C. (2009). Influencia de la motivación intrínseca y extrínseca sobre la transmisión de conocimiento. El caso de una organización sin fines de lucro. *Revista de Economía Pública, Social y Cooperativa,* (66), 187-211. https://www.redalyc.org/articulo.oa?id=17413043009

Ribas, F. B., y Provasi, M. R. (2024). Adopción de inteligencia artificial generativa: percepciones de alumnos de ciencias económicas. *In XX Simposio Regional de Investigación Contable.* 2683-6734. http://sedici.unlp.edu.ar/handle/10915/175480

Suárez-Lima, G. J., Posligua-Fernández, J. A., Carpio-Cruz, O. J., y Guriz, N. O. (2025). Aplicación de la inteligencia artificial para la personalización del aprendizaje en entornos universitarios: desafíos, oportunidades y su impacto en la mejora del rendimiento académico. *Revista Social Fronteriza, 5*(4), 1-19. https://doi.org/10.59814/resofro.2025.5(4)786

Tamayo-Arellano, V. R., Romero-Acosta, Y. J., Zapata-Romero, S. V., y Sánchez-Macías, R. A. (2024). Integración de la inteligencia artificial en la enseñanza universitaria para optimizar el proceso de aprendizaje. *Magazine de las Ciencias: Revista de Investigación e Innovación, 9*(2), 68-94. https://doi.org/10.33262/rmc.v9i2.3104

Tarira-Caice, C. A., Delgado-González, M. J., Tarira-Rojas, L. D., y Rivas-Mera, D. C. (2018). Motivación extrínseca para el aprendizaje de matemática. *Mundo recursivo, 1*(2), 165-182. http://www.atlantic.edu.ec/ojs/index.php/mundor/article/view/57

Torres-Cruz, E., Torres-Cruz, F., Torres-Segura, J. W., Basurco-Chambilla, T. R., Mamani-Luque, O. M., López-Cueva, M. A., Tito-Lipa, J. P., Supo-Gutierrez, J. A., y Coyla-Idme, L. (2023). *Impacto de la inteligencia artificial en la educación universitaria* (pp. 80–91). Editora Científica Digital. https://dx.doi.org/10.37885/230513147

## Authors

**SANTIAGO VINUEZA-VINUEZA** earned his PhD in Educational Research from César Vallejo University in Peru in 2025, a Master's degree in Communication Networks from the Faculty of Engineering at the Pontifical Catholic University of Ecuador in 2016, a Master's degree in Educational Information Systems from Israel Technological University in 2009, a Bachelor's degree in Education with a specialization in Computer Science from the Faculty of Philosophy, Letters, and Educational Sciences at the Central University of Ecuador in 2002, and a Bachelor's degree in Computer Engineering from the Autonomous University of Quito in 2002. He is currently a full-time professor in the Faculty of Economic Sciences at the University of Ecuador. His main research focuses on education and Information and

Communication Technologies. He is the author of book chapters and articles published in high-impact journals (Emerging Sources Citation Index, Scopus, Latindex, Redalcy, SciELO)**.**

**ALEJANDRA FONSECA-FACTOS** earned her Master's degree in Education with a specialization in Innovation and Educational Leadership from Indoamerica University (Ecuador). She also holds a degree in Electronics and Telecommunications Engineering from the University of the Armed Forces-ESPE.

Currently, she teaches both the regular and supplementary technical high school programs at the Uyumbicho Educational Unit in Mejía Canton, Pichincha Province. She has served as a peer reviewer for the journal Conectividad-Rumiñahui University Institute. She collaborates with the Ministry of Education, Sports, and Culture, providing technical and pedagogical support for the implementation of educational robotics projects in schools within the education system. Her main research interests include STEAM approaches, educational robotics, educational innovation, the didactics of exact and natural sciences (physics), biomedicine, and technologies applied to education. She is the author of several articles published in conferences and high-impact journals (IEEE Xplore, Scielo, Latindex, DOAJ).**).**

## Declaration of authorship-CRediT

**SANTIAGO VINUEZA-VINUEZA:** State of the art, related concepts, methodology, validation, data analysis, writing – first draft.

**ALEJANDRA FONSECA-FACTOS: State of the art, related concepts, data analysis, organization and integration of collected data, conclusions, final writing and editing**.

## Statement on the use of artificial intelligence

The authors declare that they did not use Artificial Intelligence (AI) tools for any part of the manuscript. All material was reviewed and validated by the authors, who are responsible for its accuracy and rigor.