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Artificial intelligence as a support strategy for mathematics learning among university students in the faculty of sciences

[La inteligencia artificial como estrategia de apoyo para el aprendizaje de las matemáticas en estudiantes universitarios de la Facultad de Ciencias]

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Resumen

La presente investigación tuvo como propósito fundamental determinar la relación existente entre la Inteligencia Artificial (IA) como estrategia de apoyo pedagógico y el proceso de aprendizaje de las matemáticas en estudiantes del primer ciclo de la Facultad de Ciencias de la Universidad Nacional Santiago Antúnez de Mayolo (UNASAM), durante el semestre académico 2025-I. El estudio se fundamenta en la creciente necesidad de adaptar las metodologías de enseñanza a la era digital. La metodología adoptada fue de tipo aplicada, con un enfoque cuantitativo y un nivel correlacional de diseño no experimental y de corte transversal. La población y muestra fueron censales, integradas por 104 estudiantes. Para la recolección de datos, se utilizaron dos cuestionarios estructurados bajo la escala de Likert, los cuales fueron validados por juicio de expertos y sometidos a pruebas de confiabilidad mediante el Alfa de Cronbach. Los resultados obtenidos a través del coeficiente de correlación de Spearman arrojaron un valor de $r = 0.937$ con un nivel de significancia de $p < 0.01$. Estos hallazgos permiten concluir que existe una relación directa, positiva y de una intensidad muy alta entre el uso de la IA y el aprendizaje matemático. Se demostró que las dimensiones de optimización, personalización y motivación potenciadas por la IA influyen significativamente en la capacidad de resolución de problemas, comunicación y razonamiento lógico-matemático de los universitarios.

Palabras clave: Inteligencia artificial; aprendizaje de la matemática; didáctica universitaria; estrategias de apoyo; personalización del aprendizaje.

Abstract

The main objective of this research was to determine the relationship between Artificial Intelligence (AI) as a pedagogical support strategy and the mathematics learning process in first-cycle students of the Faculty of Sciences at the Santiago Antúnez de Mayolo National University (UNASAM), during the 2025-I academic semester. The study is based on the growing need to adapt teaching methodologies to the digital era. The methodology adopted was an applied type, with a quantitative approach and a correlational level of non-experimental and cross-sectional design. The population and sample were census-based, made up of 104 students. For data

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collection, two questionnaires structured under the Likert scale were used, which were validated by expert judgment and subjected to reliability tests using Cronbach's Alpha. The results obtained through the Spearman correlation coefficient showed a value of $r = 0.937$ with a significance level of $p < 0.01$. These findings allow us to conclude that there is a direct, positive and very high intensity relationship between the use of AI and mathematical learning. It was demonstrated that the dimensions of optimization, personalization and motivation enhanced by AI significantly influence the problem-solving capacity, communication and logical-mathematical reasoning of university students.

Keywords: Artificial intelligence; mathematics learning; university didactics; support strategies; personalization of learning.

I. Introduction

Higher education is currently at a turning point driven by rapid technological evolution. Mathematics instruction—traditionally viewed as one of the most challenging disciplines for early-stage engineering and science students—requires a transformation in its pedagogical strategies. The EDUCAUSE Horizon Report 2023 posits that Artificial Intelligence (AI) is not merely a supplementary tool but a driver of structural change, enabling a shift from mass instruction to deeply personalized learning. The core issue prompting this study lies in the persistent difficulties faced by first-year students at the UNASAM Faculty of Science in grasping abstract concepts and applying them to real-world problem-solving. Despite institutional efforts, conventional methods often fail to engage a generation of digital natives who demand immediacy, interactivity, and content relevance. It is here that AI, as a support strategy, offers a promising alternative by automating routine tasks and providing intelligent tutoring systems capable of adapting to each individual's learning pace. Scientific literature supports this transition globally; Moral et al. (2023) argue that the use of AI-based assistants substantially enhances students' perceived self-efficacy in virtual environments. Within the Peruvian context—and specifically in the Áncash region—there is a significant gap in the implementation of these technologies within university mathematics curricula.

This research is justified on both technical and pedagogical grounds, as it seeks to provide empirical evidence regarding how AI can optimize mathematics learning. The study addresses three critical dimensions of AI: the optimization of study time, the personalization of learning pathways, and the enhancement of intrinsic motivation. Concurrently, it evaluates the impact on fundamental mathematical competencies: problem-solving ability, precision in communicating mathematical ideas, and rigor in reasoning and proof. Given this context, the following general research question was posed: What is the relationship between artificial intelligence as a support strategy and mathematics learning among students at the UNASAM Faculty of Science (2025-I)? To address this, specific objectives were formulated to break down this relationship across each of its dimensions, thereby enabling a holistic understanding of the phenomenon under study. The findings are expected not only to contribute to the body of academic knowledge but also to serve as a foundation for university policies that foster the ethical and efficient integration of AI into the classroom. Regarding the research topic, there are existing studies—both correlational and quasi-experimental—that are closely related to the present work (specifically, studies on AI as a support strategy for student mathematics learning); these were duly taken into account in this research.

Luzuriaga et al. (2023) explored the effects of incorporating digital educational technologies on student performance in mathematics. Methodologically, a non-experimental quantitative research approach with a descriptive-correlational design was employed. Two surveys were conducted using questionnaires to determine the importance students attached to mathematics in their professional training and their attitudes toward the subject. The study involved a sample of 45

GESj
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students (20 men and 25 women). The findings revealed a significant correlation between the use of digital technologies in education and academic performance in mathematics, indicating a moderate effect associated with the use of Graphmatica. Meanwhile, Moral et al. (2023) conducted a study to determine the implications of artificial intelligence in the mathematics coursework of 120 students at the University of Málaga. The results showed that students were highly interested in developing their own virtual assistants and integrating them into online social networks. An improvement in students' digital capabilities was also observed, suggesting that this experience played a key role in developing fundamental technological skills. Consequently, participants expressed a remarkably high level of satisfaction with the chatbots they created. Thus, the use of these virtual assistants as educational support tools appears promising, as it could optimize the learning experience and boost students' mathematical proficiency.

Similarly, Loza et al. (2022) demonstrated how to foster the development of mathematical competencies through the use of surface visualization tools and virtual environments within a project-based virtual learning setting. Various activities were conducted using Lumen to assess students' learning progress and problem-solving capabilities. An analysis of assessments administered before and after the first supervised activity revealed an average improvement of 43% among 242 students, while the second supervised activity showed an average increase of 30% among 210 students. Thus, technology-based remote learning emerges as a valuable resource that supports the educational process by focusing on skill development through active and dynamic learning.

In their master's thesis, Gonzales (2024) aimed to analyze the use of artificial intelligence in mathematics instruction at the secondary education level. To conduct this work, a systematic documentary study with an exploratory-descriptive scope was carried out to provide a theoretical foundation for the research objectives; additionally, information from 48 texts evaluating the application of intelligent systems for teaching the subject was examined. The results showed that intelligent tutors are the AI tools most frequently used in education; they also revealed that technical and technological resources are the primary factors to consider when implementing these systems, and that while the integration of AI into education does not follow a single methodological process, it aligns with various phases of existing methodologies. Finally, it was concluded that intelligent systems improve learning efficiency by offering options to automate and personalize instruction. Another study by García (2024) examined how the use of ChatGPT influences the academic performance of dentistry students at a private university in Lima. This was basic, quantitative research with a correlational scope, conducted without experimental intervention. The sample consisted of 113 students who completed an online questionnaire; the results showed a high level of ChatGPT usage (55.8%), with 54.9% of students reporting good academic performance, leading to the conclusion that the use of ChatGPT had a significant impact on the academic performance of dentistry students at the specific university in Lima. Similarly, in a 2024 master's thesis titled *Determining the relationship between artificial intelligence and the perception of academic performance among students at an educational institution in the Villa El Salvador district*—which employed basic research, a descriptive-correlational level, a quantitative approach, and a non-experimental design to analyze a sample of 133 students—Yoplac (2024) concluded that artificial intelligence is not related to the academic performance of students at an educational institution in the Villa El Salvador district.

Regarding concepts of artificial intelligence (AI), AI in the educational sphere is defined not merely as a set of algorithms but as a pedagogical architecture capable of simulating human cognitive processes to enhance teaching. According to Moral et al. (2023), implementing AI in higher education enables the optimization of instructional resources. AI involves systems and algorithms that allow machines to perform tasks requiring human-level or superior intelligence through techniques such as machine learning and natural language processing (Porcelli, 2021).

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Ahmed et al. (2021) indicate that artificial intelligence is a crucial element in the digital transformation process, as it offers significant benefits to the education sector and creates opportunities for student interaction through educational dialogue. This enriches the teaching and learning experience by enabling scientific content to be presented in an interactive and accessible manner and by simplifying continuous assessment procedures—factors that have driven the adoption of artificial intelligence. Consequently, the teacher is regarded as a fundamental component of the educational system, and the quality of their training is directly linked to the effectiveness of pedagogical strategies. Furthermore, entities responsible for teacher training must adhere to standards that encompass degree attainment, mastery of their specific subject area, and the ability to teach effectively and professionally by employing—and striving to appropriately integrate—various learning methods into their instruction.

The dimensions of Artificial Intelligence (AI) are defined as follows:

- Learning Optimization: This dimension refers to the ability of AI tools to reduce cognitive load during mechanical tasks, allowing the student to focus on high-level processes.
- Personalized Learning: Based on the learning style theories of Alonso and Gallego (2003), AI adapts content according to progress and difficulties detected in real-time, breaking the "one-size-fits-all" teaching model.
- Motivation: Interactivity and immediate feedback are critical factors that—according to Ausubel's (1985) theory of meaningful learning—facilitate the student's readiness to engage with new knowledge.

Furthermore, regarding concepts of learning, Alonso and Gallego (2003) define it as a "process of acquiring a relatively enduring disposition to change perception or behavior as a result of experience." Soto and García (2013) define it as: "The dialectical process of appropriating content and ways of knowing, doing, living together, and being—constructed through socio-historical experience—in which relatively enduring and generalizable changes are produced as a result of the subject's activity and interaction with others; these changes enable the subject to adapt to reality, transform it, and grow as an individual." Velázquez et al. (2011) defined reflective learning as: "[...] a process in which the subject appropriates the historical-social experience accumulated throughout human development—specifically, educational content—by confronting problems derived from that content. This involves intense reflective activity that allows the subject to establish their own solution procedures and strategies—drawing on their own experiences and lived moments—to find appropriate answers. This fosters the appropriation of content and the contribution of personal resources (enriched through interaction with others), transforming both the subject and the reality in which they act, all of which promotes their holistic personal development." Whose learning dimensions are defined as:

- Problem Solving: The ability to identify, analyze, and resolve situations within a given context using mathematical models.
- Mathematical Communication: The precise use of symbolic language and the ability to provide arguments for procedures.
- Reasoning and Proof: The logical rigor required to validate conjectures and follow formal deductions.

II. Materials and Methods

Type of research

In terms of its approach, this is a quantitative study (Hernández & Mendoza, 2018). The quantitative approach is sequential and confirmatory, as it is based on an initial idea that is

GESj
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progressively refined. Once the idea is delimited, research objectives and questions are established, existing literature is reviewed, and—based on these elements—a theoretical framework or perspective is constructed.

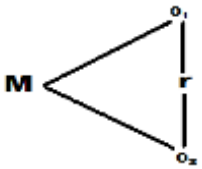
Regarding its utility, this is a type of applied research (Carrasco, 2009). Applied research is characterized by clearly defined, immediate practical objectives; that is, the research is conducted with the aim of taking action, modifying, transforming, or generating change within a specific sector of reality. Its purpose is to solve a practical problem, specifically relating to the mathematics learning of first-year students at the Unasam Faculty of Science through the use of artificial intelligence as a support strategy.

In terms of depth, this is an explanatory study; explanatory—or causal—research addresses the question "Why?" It reveals the reasons why a specific event or phenomenon behaves in a certain way, or why its existence or nature is conditioned by specific factors. The study is classified as explanatory because it seeks to clarify how the mathematical learning of first-year students at the Unasam Faculty of Science is linked to the use of artificial intelligence as a support strategy.

Research design

Research design can be defined as a structured framework adopted by the researcher to relate and control the study variables. It serves as a guide and a set of constraints for the researcher; in this sense, it becomes a framework of guidelines under which an experiment or study is conducted (Hernández & Mendoza, 2018). Statistical methods will be used to analyze learning outcomes in the Mathematics subject for both the experimental and control groups.

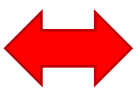
The research design will be non-experimental and quantitative, as the variables will not be deliberately manipulated. It will be cross-sectional in nature; as Hernández and Mendoza (2018) state, "cross-sectional research designs collect information at a single point in time." In alignment with the study's objectives and approach, our research design falls into the non-experimental category—specifically, the descriptive cross-sectional correlational type—structured as follows:



Where:
M : Represents the students making up the sample
O_1: Artificial intelligence as a support strategy
r : Relationship between the study variables
O_2: Mathematics learning

Population

This research study will consider a census population consisting of first-cycle students from the Faculty of Sciences enrolled in the 2025-I semester, comprising a total of 104 students.



AI as a Strategy Questionnaire
15 items: optimization, personalization, and motivation.

Mathematical Learning Questionnaire
15 items: problem-solving, communication, and reasoning

Figure 1. Pr

GESj
Vol. 8, N° 2, 2026

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III. Results

The results presented below are the product of processing data collected from 104 students at the UNASAM Faculty of Science. They are divided into a descriptive analysis of the variables and hypothesis testing using the Spearman coefficient.

Table 1: Results of the Kolmogorov-Smirnov goodness-of-fit test for the variables Artificial Intelligence and Mathematics Learning among first-semester students at the Faculty of Science – UNASAM, 2025-I.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Artificial Intelligence	,067	104	,200*	,992	104	,797
Learning optimization	,080	104	,102	,983	104	,223
Personalized learning	,101	104	,010	,978	104	,088
Motivation	,086	104	,054	,981	104	,151
Mathematics learning	,097	104	,017	,984	104	,257
Problem solving	,101	104	,011	,980	104	,124
Mathematical communication	,089	104	,042	,982	104	,182
Reasoning and proof	,090	104	,039	,982	104	,160

The results of the Kolmogorov-Smirnov test indicate that the analyzed variables (learning optimization, personalized learning, motivation, artificial intelligence, problem-solving, mathematical communication, reasoning and proof, and mathematics learning) follow a normal distribution ($p > 0.05$). Consequently, parametric tests, such as Pearson correlation, should be applied to analyze the relationships.

Table 2: Relationship between mathematics learning and learning optimization as an artificial intelligence strategy.

Correlations

		Learning optimization	Mathematics learning
Learning optimization	Pearson Correlation	1	,972**
	Sig. (2-tailed)		,000
	N	104	104
Mathematics learning	Pearson Correlation	,972**	1
	Sig. (2-tailed)	,000	
	N	104	104

**. Correlation is significant at the 0,01 level (2-tailed).

The table demonstrates a very high positive correlation between learning optimization and mathematics learning (r=0.972). This indicates that when AI-based optimization strategies are applied, mathematics learning improves significantly.

The significance value of $p<0.0001$ confirms that this relationship is statistically significant; the data show that students participating in learning processes optimized through Artificial Intelligence techniques tend to achieve better results in mathematics, thereby supporting the effectiveness of these strategies as tools for enhancing academic performance.

GESj
Vol. 8, N° 2, 2026

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Table 3: Relationship between mathematics learning and personalized learning as an Artificial Intelligence strategy

Correlations

		Personalized learning	Mathematics learning
Personalized learning	Pearson Correlation	1	,460**
	Sig. (2-tailed)		,000
	N	104	104
Mathematics learning	Pearson Correlation	,460**	1
	Sig. (2-tailed)	,000	
	N	104	104

**. Correlation is significant at the 0,01 level (2-tailed).

Table 3 presents the relationship between personalized learning and mathematics learning, considering the use of artificial intelligence as an educational strategy. The results show a positive and statistically significant correlation between the two variables, with a Pearson coefficient of r=0.972 and a significance level of p<0.0001. This indicates a moderate association: as personalized learning practices increase, levels of mathematics learning also tend to improve.

Table 4: Relationship between mathematics learning and motivation as an artificial intelligence strategy.

Correlations

		Motivation	Mathematics learning
Motivation	Pearson Correlation	1	,984**
	Sig. (2-tailed)		,000
	N	104	104
Mathematics learning	Pearson Correlation	,984**	1
	Sig. (2-tailed)	,000	
	N	104	104

**. Correlation is significant at the 0,01 level (2-tailed).

The results in Table 4 show a very high positive correlation between motivation and mathematics learning (r=0.984; p<0.0001). This coefficient indicates that as student motivation increases—fostered by strategies supported by artificial intelligence—their mathematics learning also improves significantly.

The statistical significance (p<0.0001) confirms that this relationship is highly reliable, ruling out the possibility that the result is due to chance. In practical terms, these data demonstrate that motivation is a key factor in boosting mathematical performance and that strengthening it through artificial intelligence tools can lead to substantial improvements in the learning process.

GESj
Vol. 8, N° 2, 2026

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Table 5: Relationship between artificial intelligence as a support strategy and mathematics learning among first-cycle students at the Faculty of Science, Semester 2025-I, UNASAM.

Correlations

		Artificial Intelligence	Mathematics learning
Artificial Intelligence	Pearson Correlation	1	,937**
	Sig. (2-tailed)		,000
	N	104	104
Mathematics learning	Pearson Correlation	,937**	1
	Sig. (2-tailed)	,000	
	N	104	104

**. Correlation is significant at the 0,01 level (2-tailed).

The results demonstrate a positive and highly significant correlation between artificial intelligence as a support strategy and mathematics learning among first-cycle students in the Faculty of Science. The Pearson correlation coefficient obtained ($r=0.937$; $p<0.01$) indicates that greater use or integration of artificial intelligence tools corresponds to a higher level of mathematical learning reported by the students. This correlation, in addition to being strong, suggests a direct and consistent relationship between the two variables, supporting the pedagogical effectiveness of artificial intelligence in early-stage educational settings.

Hypothesis Testing

In the study *Artificial Intelligence as a Support Strategy and Mathematics Learning among First-Cycle Students at the Faculty of Science*, the Kolmogorov-Smirnov test ($n > 50$) was applied to determine the data distribution. This procedure made it possible to establish whether the analyzed variables followed a normal distribution, which guided the selection of the appropriate statistical tests for the analysis.

General Hypothesis

Statistical Hypothesis

H_0: The data follow a normal distribution.

H_1: The data do not follow a normal distribution.

Significance Level

$\alpha = 0.05$

Calculation

Table 6: Results of the Kolmogorov-Smirnov goodness-of-fit test for the variables Artificial Intelligence and Mathematics Learning among first-cycle students at the Faculty of Science – UNASAM, 2025-I.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Learning optimization	,080	104	,102	,983	104	,223
Personalized learning	,101	104	,010	,978	104	,088
Motivation	,086	104	,054	,981	104	,151
Artificial Intelligence	,067	104	,200*	,992	104	,797
Problem solving	,101	104	,011	,980	104	,124
Mathematical communication	,089	104	,042	,982	104	,182
Reasoning and proof	,090	104	,039	,982	104	,160
Mathematics learning	,097	104	,017	,984	104	,257

*. This is a lower bound of the true significance.

a. Lilliefors significance correction

GESj
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The results of the Kolmogorov-Smirnov test indicate that the variables analyzed (learning optimization, personalized learning, motivation, artificial intelligence, problem-solving, mathematical communication, reasoning and proof, and mathematics learning) follow a normal distribution ($p > 0.05$). Consequently, parametric tests, such as Pearson correlation, should be applied for the analysis of relationships

IV. Conclusions

- A direct, positive, and very strong relationship was found between artificial intelligence as a support strategy and mathematics learning among students at the UNASAM Faculty of Science ($r = 0.937$).
- Optimizing study processes through intelligent tools enables better management of time and resources, showing an excellent correlation with academic performance.
- AI-supported personalized learning is the key factor in bridging cognitive gaps among first-year students, facilitating a smoother transition to advanced university-level mathematics.
- Motivation boosted by AI interactivity is the decisive factor in improving students' attitudes toward complex problems, thereby reducing early dropout rates in basic science courses.

References

Ahmed, M., Rabea, A., & Abdullah Abdulkareem, B. A. (2021). The Reality of Using Artificial Intelligence Techniques in Teacher Preparation Programs in Light of the Opinions of Faculty Members: A Case Study in Saudi Qassim University. Multicultural Education. Vol. 7 Num 1, 5-16.

Alonso, C. M., & Gallego, D. J. (2003). Cómo diagnosticar y mejorar los estilos de aprendizaje. UNED, Formación Permanente.

Ausubel, D. (1985). Psicología Educativa. Un punto de vista cognoscitivo. México: Trillas.

Carrasco, S. (2009). Metodología de la Investigación Científica. Lima: Editorial San Marcos.

García Murga, J. A. (2024). Influencia del uso del ChatGPT en el rendimiento académico de alumnos de odontología de una universidad particular de Lima. Universidad César Vallejo. Lima: Tesis de maestría. Maestría en Docencia Universitaria.

Gonzáles Jiménez, P. F. (2024). Uso de la Inteligencia artificial en la enseñanza de matemática en el nivel de ducación secundaria. Universidad de Loja. Ecuador: Informe de tesis. Licenciado en Pedagogía de las Matemáticas y la Física.

Hernández Sampieri, R., & Mendoza Torres, C. P. (2018). Metodología de la investigación. Las rutas cuantitativa, cualitativa y mixta. México: Mc Graw Hill Education.

Horizon. (2023). Teaching and Learning Edition. EDUCAUSE Horizon Report.

Luzuriaga Jaramillo, H. A., Hidalgo Cajo, D. P., Avilés Luna, E. S., Calderón Zambrano, R. L., & Mata López, J. C. (2023). Impacto de las tecnologías educativas digitales y rendimiento académi-co en matemáticas. Runas: Journal of education & Culture.

Moral Sánchez, S. N., Ruiz Rey, F. J., & Cebrián de la Serna, M. (2023). Analysis of artificial intelligence chatbots and satisfaction for learning in mathematics education. IJERI: International Journal of Educational Research and Innovation, 1-14. DOI:https://doi.org/10.46661/ijeri.8196.

Porcelli, A. M. (2021). La inteligencia artificial y la robótica: sus dilemas sociales, éticos y juridicos. Derecho Global. Estudios sobre Derecho y Justicia. Vol.6 Num. 16, 49–105.

Ruiz Loza, S., Medina Herrera, L., Molina Espinosa, J., & Huesca Juárez, G. (2022). Facilitating Mathematical Competencies Development for Undergraduate Students During the Pandemic Through ad-hoc Technological Learning Environments. Frontiers In Education, Vol. 7, https://doi.org/10.3389/feduc.2022.830167.

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ISSN 2663-3787
DOI: https://doi.org/10.32829/gesj.v8i2.245

Soto, M., & García, A. (2013). El aprendizaje escolar un reto para la escuela contemporánea. Curso 27. Congreso Internacional Pedagogía 2013. Ministerio de Educación. Habana: Sello editor Educación Cubana.

Velasquez Peña, E. A., Ulloa Reyes, L. G., & Hernández Mujica, J. L. (2011). Hacia un aprendizaje reflexivo. Por una Educación mejor y más eficiente. Editorial Académica Española, 52.

Yoplac Ramirez, K. J. (2024). Inteligencia Artificial y percepción del rendimiento académico en estudiantes de una institución educativa del distrito de Villa el Salvador 2024. Universidad César Vallejo. Lima: Tesis de maestría. Administración de la Educación.

GESj
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Annex 1. Questionnaire

ARTIFICIAL INTELLIGENCE SCALE

Instructions: This questionnaire refers to Artificial Intelligence as a support strategy used by students of the Faculty of Sciences at UNASAM in their mathematics learning process, specifically regarding learning optimization, personalized learning, and motivation.

There is no time limit for answering the questionnaire. There are no right or wrong answers. It will be useful to the extent that you are honest in your responses. To best describe your usual thoughts, choose the score from 1 to 4 that best describes you according to the following rating scale:

Never	1
Sometimes	2
Almost always	3
Always	4

Answer each statement by placing a checkmark in the box that you consider most correct.

N°	Statements	Scale			
Learning optimization		1	2	3	4
01.	You organize your study time				
02.	You set study goals				
03.	You prepare your study space				
04.	You eliminate all distractions				
05.	Optimal approach to your study objectives				
Personalized learning		1	2	3	4
06.	Your learning is inclusive and effective.				
07.	You use mobile devices to support your studies				
08.	You frequently use online platforms				
09.	You are better organized in your tasks				
10	I think I should control my activity using social media.				
Motivation		1	2	3	4
11.	You demonstrate a positive attitude toward the subject matter				
12.	You create a pleasant learning environment				
13	You inspire respect among your classmates				
14.	You enjoy class activities				
15	You are curious and eager to improve yourself every day				

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MATHEMATICS LEARNING SCALE

Instructions: This questionnaire assesses mathematics learning among students in the Faculty of Sciences at UNASAM, specifically in the areas of problem-solving, mathematical communication, and reasoning and proof.

There is no time limit for completing the questionnaire. Its effectiveness will depend on your honest responses. To best describe your usual thinking, choose the score from 1 to 4 that best describes you according to the following rating scale:

Never	1
Sometimes	2
Almost always	3
Always	4

Answer each statement by placing a checkmark in the box that you consider most correct.

N°	Statements	Scale			
Problem solving		1	2	3	4
01.	You are in the process of clearly recognizing a problem				
02.	Analyze specific real-world problems				
03.	Solve specific real-world problems				
04.	Develop a plan to solve a problem				
05.	Implement the plan to solve a problem				
Mathematical Communication		1	2	3	4
06	You recognize and correct your own and others' errors based on sound reasoning				
07	You master basic mathematical concepts				
08	You provide a rationale for mathematical ideas				
09	You use mathematical terms and symbols correctly				
10	You use mathematical notation correctly and consistently				
Reasoning and demonstration		1	2	3	4
11	You consider the following as expected learning outcomes in your exams				
12	You propose conjectures or possible solutions in mathematical proofs				
13	You propose a logical deduction in your reasoning				
14	You present some appropriate strategies for solving problems				
15	You evaluate the validity of an argument or a solution				

¡Thank you for your collaboration!