EthAIca. 2025; 4:422
doi: 10.56294/ai2025422

ORIGINAL

Characterization of the Use of Artificial Intelligence Tools among Students at the University of Medical Sciences of Santiago de Cuba

Caracterización del uso de herramientas de Inteligencia Artificial en estudiantes de la Universidad de Ciencias Médicas de Santiago de Cuba

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Cite as: Barroso Fontanals ME, Pacios Dorado JL, Fabars Bueno YT, Pompa Castillo M, Traba Vázquez MA. Characterization of the Use of Artificial Intelligence Tools among Students at the University of Medical Sciences of Santiago de Cuba. EthAIca. 2025; 4:422. https://doi.org/10.56294/ai2025422

Submitted: 22-07-2025 **Revised:** 11-09-2025 **Accepted:** 04-11-2025 **Published:** 05-11-2025

Editor: PhD. Rubén González Vallejo

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ABSTRACT

Introduction: since its inception, the field of artificial intelligence has evolved significantly, transitioning from a mere academic curiosity to becoming an essential tool in multiple sectors, including medicine.
Objective: to characterize the use of Artificial Intelligence tools among students at the University of Medical Sciences of Santiago de Cuba.
Method: an observational, descriptive, and cross-sectional study was conducted at the University of Medical Sciences in Santiago de Cuba from April to June 2025. The study population consisted of the university students, and a representative sample of 1 050 was obtained through stratified random sampling, ensuring the inclusion of students from different academic years who met the inclusion criteria.
Results: the most represented major was Medicine (59,52 %). A medium level of knowledge about the definition of artificial intelligence predominated (51,14 %), and the most commonly used AI tool was OpenAI ChatGPT (100 %). There was a notable positive perception of these tools (84,19 %), and 91,71 % of respondents confirmed having a positive impact from their use.
Conclusions: understanding the impact of artificial intelligence on medical education is highly relevant for preparing future professionals for an increasingly digitalized and data-driven work environment.

Keywords: Higher Education; Students; Artificial Intelligence; Medicine.

RESUMEN

Introducción: desde sus inicios, el campo de la inteligencia artificial ha evolucionado de manera significativa, pasando de ser una mera curiosidad académica a convertirse en una herramienta esencial en múltiples sectores, incluyendo la medicina.
Objetivo: caracterizar el uso de herramientas de Inteligencia Artificial en estudiantes de la Universidad de Ciencias Médicas de Santiago de Cuba.
Método: se realizó un estudio observacional, descriptivo y transversal en la Universidad de Ciencias Médicas de Santiago de Cuba en el periodo de abril a junio del año 2025. El mismo tuvo como universo a los estudiantes de la misma y se tomó una muestra representativa de 1050 de los mismos mediante muestreo aleatorio estratificado, asegurando la inclusión de estudiantes de diferentes años académicos que cumplían con los

criterios de inclusión.
Resultados: la carrera más representada fue Medicina (59,52 %). Predominó el nivel medio de conocimientos sobre la definición de inteligencia artificial (51,14 %), la herramienta de Inteligencia Artificial más usada fue el Open AI ChatGPT (100 %). Resaltó la percepción positiva de estas herramientas (84,19 %) y el 91,71 % de los encuestados confirman haber tenido un impacto positivo con el uso de las mismas.
Conclusiones: la comprensión del impacto de la inteligencia artificial en la educación médica es de gran relevancia para preparar a los futuros profesionales para un entorno laboral cada vez más digitalizado y basado en datos.

Palabras clave: Educación Superior; Estudiantes; Inteligencia Artificial; Medicina.

INTRODUCTION

Artificial Intelligence (AI) is defined as the ability of a machine to imitate human cognitive functions, such as learning, reasoning, and problem-solving. Through complex algorithms and large volumes of data, machines can perform tasks that traditionally required human intelligence.[1]

Its history dates back to the 1950s, when pioneers like Alan Turing and John McCarthy began exploring the idea that machines could simulate human intelligence. In 1956, the Dartmouth Conference marked the official birth of the field of AI. During the following decades, researchers developed basic algorithms and expert systems capable of performing specific tasks. However, the field faced several periods of stagnation due to a lack of significant progress and funding. It was from the 2010s that the situation changed drastically due to increased computational power, the availability of large datasets, and advances in deep learning algorithms, leading to a resurgence of interest and application in various fields.[2]

This resurgence has been particularly transformative in biomedicine. AI algorithms now demonstrate remarkable utility in analyzing medical images for the detection of pathologies such as diabetic retinopathy and breast cancer with accuracy comparable to that of specialists. In drug discovery, AI models significantly accelerate the identification of potential compounds and the prediction of their efficacy. Furthermore, natural language processing (NLP) systems can extract critical information from electronic health records to improve patient stratification and support clinical decisions, while predictive analytics are revolutionizing personalized medicine and epidemic forecasting.[3,4]

Although the use of AI has proven highly advantageous for prevention, diagnosis, treatment, and patient monitoring, its formal integration into medical education curricula remains incipient and uneven. It is known that current students, who develop in a digital environment, are familiar with these technologies and use them informally; however, there are no studies in the Cuban context that systematically analyze the extent, manner, and purpose of AI utilization by medical students. This lack of data represents a significant gap in understanding how future doctors are adapting to and leveraging these transformative tools. Therefore, the objective of this study is to characterize the knowledge and use of Artificial Intelligence among students at the University of Medical Sciences of Santiago de Cuba.

METHOD

An observational, descriptive, and cross-sectional study was conducted at the University of Medical Sciences of Santiago de Cuba from April to June 2025.

The study population consisted of the 8500 students enrolled at the university. The sample size was calculated using the EPIDAT 4.2 software, considering a 95 % confidence level, a margin of error of 3 %, a proportion of 50 % (due to the unknown prevalence of the characteristics under study), and a design effect of 1,2. This calculation yielded a minimum required sample size of 1,023 students. To account for potential non-responses, the sample was increased to 1050 students.

A stratified random sampling method was employed to ensure representativeness. The strata were defined based on two key factors: academic faculty (Medicine, Nursing, Medical Technology, etc.) and academic year (first through sixth year). Participants were randomly selected from each stratum proportionally to the size of the stratum in the overall population.

The inclusion criteria were: being a student at the University of Medical Sciences of Santiago de Cuba during the study period in any of its faculties or branch campuses and providing informed consent. Students who did not complete the survey in its entirety or who wished to withdraw from the study at any point were excluded. It is acknowledged that relying on voluntary completion may introduce self-selection bias.

The studied variables included:

- Sociodemographic and academic data: Faculty/branch campus and degree program (nominal scale).
- Level of knowledge about AI: Assessed with the question “How would you define Artificial

Intelligence?" Responses were categorized as 'Adequate' (aligned with a standard technical definition), 'Inadequate', or 'No knowledge' (ordinal scale).

- Types of AI tools used: A multiple-choice question listing common tools (e.g., ChatGPT, Gemini, Claude, Dall-E, GrammarlyGO) and an open option (nominal scale).
- Perception of usefulness: Measured on a 5-point Likert scale from 1 (Not useful at all) to 5 (Extremely useful) for various academic tasks.
- Perceived impact: Assessed through a series of statements about personal and academic impact, rated on a 5-point Likert scale from 1 (Strongly disagree) to 5 (Strongly agree).

Data collection was carried out through a structured, anonymous survey developed specifically for this study. The instrument contained seven items, including multiple-choice, Likert-scale, and open-ended questions. The survey underwent content validation by a panel of three experts in technology and medical education. A pilot test was conducted with 50 students (not included in the final sample) to assess clarity, internal consistency, and reliability, resulting in a Cronbach's alpha of 0.78.

The obtained data were processed using Microsoft Excel 2016 and statistically analyzed by calculating absolute frequencies and relative percentage frequencies for the categorical variables.

This study was reviewed and approved by the Institutional Ethics Committee of the University of Medical Sciences of Santiago de Cuba. All procedures were performed in accordance with the ethical standards of the institution and with the Helsinki Declaration and its later amendments. Written informed consent was obtained from all individual participants included in the study prior to survey administration. The anonymity of the students' personal data was rigorously maintained throughout the research process.

RESULTS

Students from all degree programs across the faculties and branch campuses of the University participated. The most represented were Faculty of Medicine No. 1, Faculty of Medicine No. 2, and the Faculty of Nursing – Health Technology, with 250 students each (23,81 %). In contrast, only 100 students from the Faculty of Dentistry and each of the branch campuses participated (9,52 %). The most represented degree program was Medicine, with 625 students (59,52 %), unlike the Dentistry and Health Technologies programs, which had only 100 students each (9,52 %) (table 1).

Table 1. Distribution of surveyed students from the University of Medical Sciences of Santiago de Cuba by faculty or branch campus and degree program of origin, April to June 2025

Faculty/Branch Campus of Origin	Current program of study									
	Medicine		Dentistry		Nursing		Other Degrees - Health Technologies		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Faculty of Medicine No. 1	250	23,81	0	0	0	0	0	0	250	23,81
Faculty of Medicine No. 2	250	23,81	0	0	0	0	0	0	250	23,81
Faculty of Dentistry	0	0	100	9,52	0	0	0	0	100	9,52
Faculty of Nursing – Health Technologies	0	0	0	0	150	14,29	100	9,52	250	23,81
Branch Campus: Palma Soriano	50	4,76	0	0	50	4,76	0	0	100	9,52
Branch Campus: Contramaestre	75	7,14	0	0	25	2,38	0	0	100	9,52
Total	625	59,52	100	9,52	225	21,43	100	9,52	1050	100

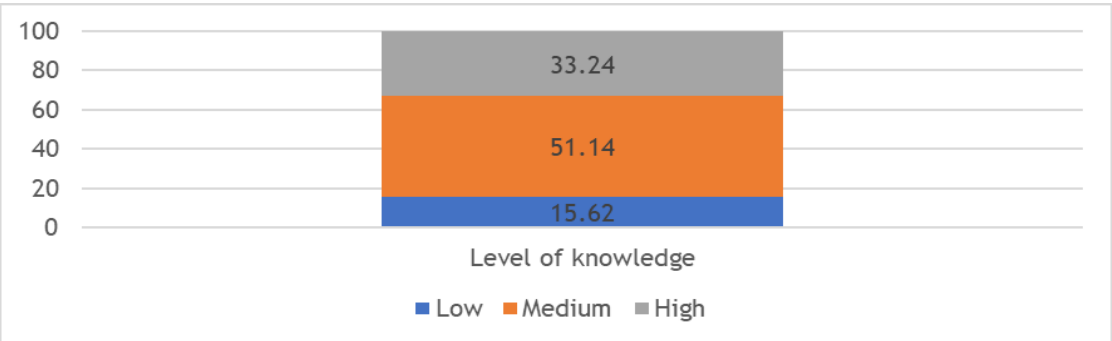

Figure 1. Distribution of surveyed students according to their level of knowledge about the definition of artificial intelligence

At the time of the survey, a medium level of knowledge about the definition of artificial intelligence predominated among 537 students, reaching 51,14 % of the total (figure 1).

Text and image-generating AI tools were the most used by students, with ChatGPT being the most frequently used (100 %). These were followed by DeepSeek (92,67 %) and Midjourney (86,76 %). The least used was the academically focused tool Brainly, with only 0,66 % of the total students (figure 2).

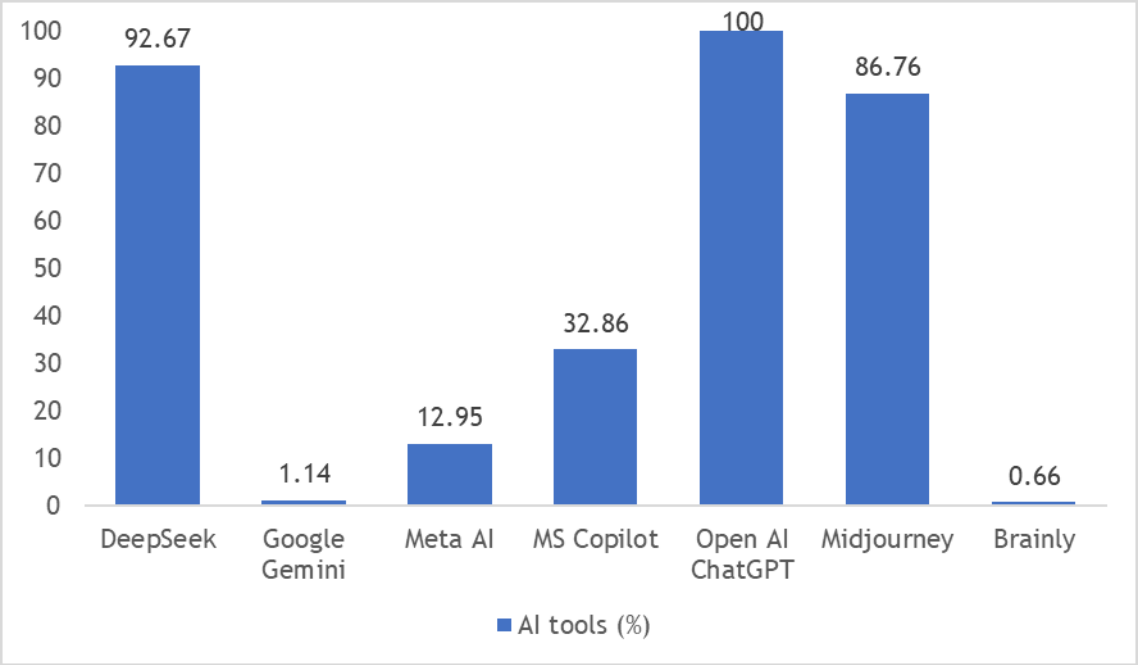

Figure 2. Distribution of surveyed students according to the AI tools they use

It is noted that 884 respondents showed a positive perception of these tools, representing 84,19 %, and none had a negative perception of them (table 2).

Table 2. Distribution of surveyed students according to their perception of the usefulness of AI tools

Perception of the usefulness of AI tools	No.	%
Positive	884	84,19
Neutral	166	15,81
Negative	0	0
Total	1050	100

91,71 % of respondents (963 students) highlighted having had a positive impact from their use, and none reported a negative impact from using these tools (figure 3).

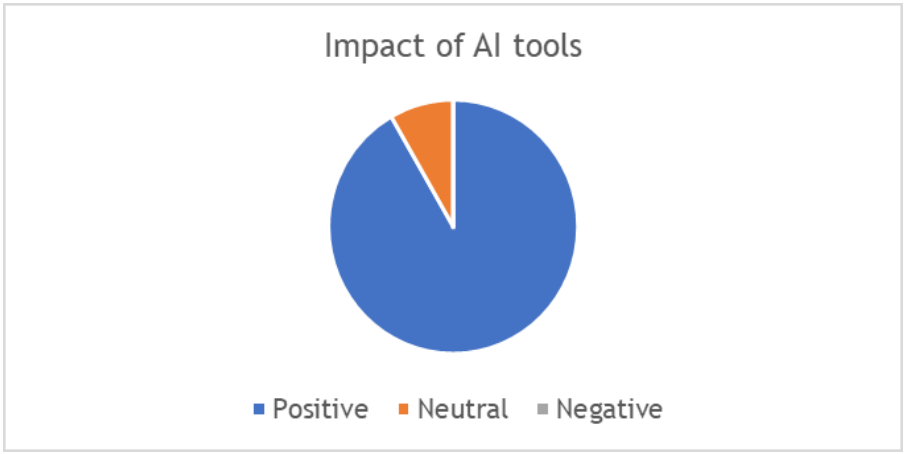

Figure 3. Distribution of surveyed students according to the impact of AI tools on their personal and academic lives

DISCUSSION

The proliferation of artificial intelligence (AI) is significantly reshaping the educational landscape, providing students with an unprecedented array of support tools for academic tasks. This study examines the adoption, knowledge, and perception of AI among university students, with findings that both align with and diverge from the global and regional discourse.[6]

The demographic predominance of Medical students in our sample is consistent with prior regional studies such as that by Montalvo Sánchez et al.[7] and reflects the high enrollment rates and competitive nature of this discipline. This prevalence may also indicate a greater propensity among these students to seek innovative technological solutions, driven by a curriculum that demands constant knowledge updating and efficient learning methodologies. However, while this focus provides valuable insights into a key group, it may limit the immediate generalizability of findings to students in disciplines with lower technological adoption rates.

Regarding knowledge of AI, our results indicate that a majority of participants are familiar with the concept. This aligns with global observations; for instance, Hornberger et al.[8] noted a growing conceptual awareness of AI in education among students worldwide, though practical competency varies greatly. This trend can be largely attributed to the extensive media coverage of AI and its gradual integration into academic curricula. However, it is crucial to challenge the assumption that self-reported knowledge translates to critical or ethical understanding. Studies such as those by Prem Bahadur[9] suggest that students often overestimate their functional literacy and underestimate the ethical complexities of AI use, a nuance not captured by our survey instrument.

The patterns of tool usage observed, with a strong preference for generative AIs like ChatGPT over academically-focused platforms, mirror findings from both regional and international research. Solano Barliza et al.[10] similarly found that students gravitate towards tools offering rapid, personalized responses for content creation and problem-solving. This preference underscores a pragmatic approach to learning efficiency. Nevertheless, this heavy reliance on generative tools raises critical questions about academic integrity, the potential for deskilling in foundational research competencies, and the alignment of these tools with specific learning objectives—issues that are central to the global debate on AI in education.

The overwhelmingly positive perception of AI's utility, particularly in improving diagnostic accuracy and personalizing learning, is supported by other studies such as those by Umpiérrez Oroño et al.[11] and Chauca Saavedra et al.[12]. This optimism reflects a recognition of AI's potential as a complementary aid. However, this discussion must be tempered by citing comparative research that presents a more cautious outlook. For example, the study by Chávez Márquez and De los Ríos Chávez[13] has shown that the perceived usefulness can sometimes be disconnected from actual learning gains and may overlook dependencies that could hinder long-term skill development.

Finally, the high reported impact of AI on students' personal and academic lives confirms its transformative role. While our study focused on medical students, contrasting with findings from economic-administrative areas, the consensus on positive impact highlights a cross-disciplinary trend. This suggests that AI's value is perceived across different academic contexts, primarily through its ability to offer accessible, personalized resources that foster a more active and satisfying learning experience.

This study has several limitations. The sample, though diverse, was not proportionally representative of all faculties, limiting the generalizability of the findings across the entire university. The data relied on self-reported perceptions and knowledge, which are susceptible to social desirability bias and may not accurately reflect actual competencies or behaviors. Furthermore, the cross-sectional design provides a snapshot in time and cannot establish causality. Crucially, this study did not explore the underlying motivations for AI use, its direct impact on learning outcomes (e.g., grades, deep understanding), or the contextual barriers (e.g., access, digital literacy, institutional policies) that may inhibit its effective adoption.

Future research should therefore employ longitudinal and mixed-methods designs to quantitatively measure the causal impact of AI tool usage on academic performance and qualitatively explore the "why" and "how" behind student adoption. Investigating instructor perspectives, developing ethical guidelines, and analyzing the institutional policies that effectively leverage AI for pedagogical innovation present critical avenues for further work. This will help build the necessary bridge to ethically and effectively integrate the infinite possibilities of AI into educational practices.

CONCLUSIONS

This study provides a crucial empirical analysis characterizing the patterns of AI use and perceptions among medical students, revealing specific gaps in its critical application and ethical understanding. By identifying these precise areas for improvement, our research moves beyond general knowledge to establish the concrete foundations for effective educational strategies that integrate AI not just as a tool, but as a core component of the curriculum, thereby preparing future professionals for a digital work environment with critical discernment and competence.

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FINANCING

The authors did not receive financing for the development of this research.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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