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ORIGINAL ARTICLE

Perception of the impact of Artificial Intelligence learning on the training of university health students

Percepción del impacto del aprendizaje de la Inteligencia Artificial en la formación de estudiantes universitarios de la salud

Percepção do impacto da aprendizagem de Inteligência Artificial na formação de estudantes universitários da área da saúde

Carmen Luisa Chauca Saavedra[I]*, Maritza Elizabeth Arones Mayuri[I], Virgilio Cenicio Quispe Nombreras[II], Santos Humberto Olivera Machado[I]

[I]Universidad Nacional San Luis Gonzaga. Perú.
[II] Instituto Superior Tecnológico Estatal Fernando León de Vivero. Perú.

***Corresponding author:** carmen.chauca@unica.edu.pe

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ABSTRACT

Introduction: Artificial Intelligence (AI) is transforming healthcare, and its impact on the training of future professionals is necessary. **Objective:** to evaluate the perception of the impact of AI on university students of health sciences. **Method:** a descriptive, observational, and cross-sectional study was conducted in a population of 1,153 university students of health sciences, resulting in a sample of 561 students from various careers (Nursing, Pharmacy and Biochemistry, Dentistry and Veterinary Medicine and Animal Husbandry) at the National University of San Luis Gonzaga in Ica, Peru. Their perception of the influence of AI in diagnosis, personalized learning, ethics, and the general impact on their training was measured by applying a validated questionnaire of twelve questions on a 5-point Likert scale. The data were analyzed using descriptive statistics and frequency analysis. **Results:** the majority of students perceived a significant impact of AI on improved diagnosis (65.2%), personalized learning (66.5%), and ethical and legal challenges (76.3%). More than two-thirds considered AI to have a significant impact on their learning. **Conclusions:** health sciences students at the National University of San Luis Gonzaga in Ica, Peru, have a positive perception of the potential of AI in their education. It is essential to develop educational strategies that effectively integrate AI into the health curriculum.

Keywords: learning; diagnosis; artificial intelligence; university students; health sciences

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RESUMEN

Introducción: la inteligencia artificial (IA) está transformando la salud y su impacto en la formación de futuros profesionales es necesaria. **Objetivo:** evaluar la percepción del impacto de la IA en estudiantes universitarios de ciencias de la salud. **Método:** se realizó un estudio descriptivo, observacional y transversal en una población de 1 153 estudiantes universitarios de ciencias de la salud, del cual resultó una muestra de 561 estudiantes de diversas carreras (Enfermería, Farmacia y Bioquímica, Odontología y Medicina Veterinaria y Zootecnia) de la Universidad Nacional San Luis Gonzaga de Ica, Perú. Se midió su percepción sobre la influencia de la IA en diagnóstico, aprendizaje personalizado, ética y el impacto general en su formación con la aplicación de un cuestionario validado de doce preguntas en una escala Likert de 5 puntos. Los datos se analizaron mediante estadística descriptiva y análisis de frecuencias. **Resultados:** la mayoría de los estudiantes percibieron una alta influencia de la IA en la mejora del diagnóstico (65,2%), la personalización del aprendizaje (66,5%) y los desafíos éticos y legales (76,3%). Más de dos tercios consideraron que la IA tiene un alto impacto en su aprendizaje. **Conclusiones:** los estudiantes de ciencias de la salud de la Universidad Nacional San Luis Gonzaga de Ica, Perú, tienen una percepción positiva del potencial de la IA en su formación. Es fundamental desarrollar estrategias educativas que integren eficazmente la IA en el currículo de salud.

Palabras clave: aprendizaje; diagnóstico; inteligencia artificial; estudiantes universitarios; ciencias de la salud

RESUMO

Introdução: a inteligência artificial (IA) está transformando a saúde e seu impacto na formação de futuros profissionais é necessário. **Objetivo:** avaliar a percepção do impacto da IA em estudantes universitários de ciências da saúde. **Método:** foi realizado um estudo descritivo, observacional e transversal em uma população de 1.153 estudantes universitários de ciências da saúde, resultando em uma amostra de 561 estudantes de diversas carreiras (Enfermagem, Farmácia e Bioquímica, Odontologia e Medicina Veterinária e Zootecnia) da Universidad Nacional San Luis Gonzaga de Ica, Peru. A percepção deles sobre a influência da IA no diagnóstico, no aprendizado personalizado, na ética e no impacto geral no treinamento foi medida usando um questionário validado de 12 perguntas em uma escala Likert de 5 pontos. Os dados foram analisados por meio de estatística descritiva e análise de frequência. **Resultados:** a maioria dos alunos percebeu uma alta influência da IA na melhoria do diagnóstico (65,2%), na personalização da aprendizagem (66,5%) e nos desafios éticos e legais (76,3%). Mais de dois ter çossentiram que a IA tem um alto impacto em seu aprendizado. **Conclusões:** estudantes de ciências da saúde da Universidad Nacional San Luis Gonzaga em Ica, Peru, têm uma percepção positiva do potencial da IA em sua formação. É essencial desenvolver estratégias educacionais que integrem efetivamente a IA ao currículo de saúde.

Palavras-chave: aprendizagem; diagnóstico; inteligência artificial; estudantes universitarios; ciências da saúde

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INTRODUCTION

The use of artificial intelligence (AI) has become widespread in our daily lives and its commercialization has begun to expand geographically.[1] Advances in computer science and technology have enabled the application of artificial intelligence such as machine learning and deep learning, in healthcare information systems.[2,3]

AI has grown exponentially in the healthcare field with the transformation of clinical practice. Advanced diagnostic tools allow customization of educational content to the needs of individual learners and raises ethical questions about data privacy and algorithmic bias. Addressing these issues is crucial to integrating AI into medical education.

The current shift is rapidly transforming dentistry and creating exciting opportunities. Advances in microbiology, immunology, and neuroscience are enabling personalized care. AI has been extensively researched and can now be applied throughout the dental care continuum[4,5,6,] from patient diagnosis[7,8,9,10] to the establishment of treatment plans and prognostic analysis of treatment.

Dental AI can detect periodontal tumors,[11,12] periodontitis and other diagnostic features and techniques. Artificial dental intelligence enables accurate diagnosis through rational screening. In addition, in specialized data-intensive fields such as radiology, ophthalmology, etc., artificial intelligence has been increasingly integrated into decision support systems.[13]

Medical education plays an important role in shaping the healthcare workforce of the future, which directly affects patient care and public health outcomes.[14] As healthcare continues to evolve, driven by technological advances, demographic shifts, and changing disease patterns, the field of medicine and pharmacology faces significant challenges and opportunities.[15,16]. Navigating these changes requires careful analysis of current and future research to anticipate future improvements.[17]

Similarly, the integration of AI into the medical sciences education sector is an opportunity, although it is not without its challenges. These include the need for a comprehensive approach to ensure sustainable development, inclusion, and equity in the use of AI in education.[18,19] In addition, there is an urgent need to develop inclusive data systems and better prepare teachers and students for AI-enabled educational environments.[20,21]

The ultimate goal of AI is to mimic the human ability to reason, learn, solve problems, and adapt to new situations through advanced computer programming. Artificial intelligence is defined as the scientific and technical study of the computational understanding of what is commonly referred to as intelligent behavior and the production of products that exhibit such behavior.[22]

The integration of these types of tools into the training of healthcare students encompasses improved diagnosis, personalization of learning, use of advanced tools, and consideration of ethical and legal challenges. These dimensions are essential to understanding the impact of AI on medical education and practice.

In this regard, some studies have been conducted on the attitudes and opinions of dental students in Korea, Peru, and Turkey.[23] Also in Saudi Arabia and Brazil, leading to positive attitudes of students toward AI in dentistry.[24,25,26]

Assessing future physicians' perception of AI not only ensures that their skills are harnessed to improve medical education, but also creates a framework for the ethical and effective use of technology in healthcare, ensuring that graduates are fully equipped for the challenges of an evolving healthcare environment. However, even studies are limited on the topic and each institution must be able to evaluate them in their academic context. Therefore, the following study proposes to assess the perceived impact of AI on student learning in the health sciences.

METHOD

This was a descriptive, observational, cross-sectional study. The population consisted of 1,153 university students of health sciences of the Universidad Nacional San Luis Gonzaga de Ica. They were distributed as follows: 273 in Nursing, 441 in Pharmacy and Biochemistry, 220 in Dentistry and 219 in Veterinary Medicine and Animal Husbandry.

Of these, the sample size was calculated with a confidence level of 95% and a margin of error of 5%. Therefore, the sample corresponded to 561 subjects between men and women of academic semesters I, III, VII and IX, from 17 to 38 years of age. For a total of 146 students of nursing, 156 of Pharmacy and Biochemistry, 173 of Dentistry and 86 of Veterinary Medicine and Animal Husbandry.

A written survey was designed that included 12 questions on a 5-point Likert scale. The undergraduate dental students spent 20 minutes developing the survey. There were 4 questions for each dimension. Responses were scored as follows: Strongly Disagree: 1; Disagree: 2; Neutral: 3; Agree: 4; Strongly Agree: 5.

The minimum and maximum possible points were 4 and 20. The scores were classified from 1 to 4:1 (very low); 5-8:2 (low); 9-12:3 (fair); 13-16:4 (high); and 17-20:5 (very high). Data analysis was performed according to descriptive statistics in summary measures of absolute and relative frequencies, Kolmogorov-Smirnov test for the evaluation of normality and frequency analysis. A statistical probability value of $p<0.05$ was considered significant in the study. The statistical program “Paquete Estadístico para las Ciencias Sociales”, version 25.0 in Spanish in Excel was used for data management.

Expert judges validated the questionnaire. It was structured in three sections. The first part of the questionnaire was composed of questions on sociodemographic characteristics, such as: age, sex and semester of study. In the second part, which corresponded to 12 questions grouped into three dimensions: 4 questions on the use of artificial intelligence in clinical radiographic diagnosis, 4 on learning in their academic training, and 4 on ethical and legal challenges in their university training. In addition, they were asked to define their level of agreement, choosing one of the following values: Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree.

The standards established in the Declaration of Helsinki, which include ethical principles for conducting research with human subjects, were taken into account. The ethics committee of the Universidad Nacional San Luis Gonzaga de Ica approved the study (CEI-UNICA N0003/04-2024) and the questionnaire was completely confidential and anonymous. Any student currently enrolled and regularly attending the Faculty of Nursing, Pharmacy and Biochemistry, Dentistry, Veterinary Medicine and Zootechnics, Dentistry could participate in the survey. All participants obtained informed consent before completing the questionnaire.

RESULTS

The results shown in Table 1 indicate that more than half of the students (366) demonstrated a high level of perceived influence of AI in improving clinical diagnosis in their practices with patients. On the other hand, the distribution of responses on the level of perception of the influence of AI on the improvement of clinical diagnosis in their practices with patients was concentrated in the high category, with 65.2%.

Table 1: Level of perception of AI in improving clinical diagnosis in their practices with patients

		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	Very low	6	1,1	1,1	1,1
	Low	3	0,5	,5	1,6
	Just	86	15,3	15,3	16,9
	High	366	65,2	65,2	82,2
	Very high	100	17,8	17,8	100,0
	Total	561	100,0	100,0	

According to the results shown in Table 2, approximately two-thirds of the students (373 out of 561) demonstrated a high level of perception of the influence of AI in personalizing learning on the training content, which shows that 81.3% of the respondents considered the influence of this technology on their training content to be high or very high.

Table 2: Perception of the level of influence of AI in the personalization of learning on training content

		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	Very low	4	0,7	0,7	0,7
	Low	1	0,2	0,2	0,9
	Just	100	17,8	17,8	18,7
	High	373	66,5	66,5	85,2
	Very high	83	14,8	14,8	100,0
	Total	561	100,0	100,0	

On the other hand, the results shown in Table 3 determine that the distribution of responses on the level of influence of AI on the ethical and legal challenges of training was concentrated in the high category, with 76.3%. Of the total sample, 428 demonstrated a high level of knowledge about the influence of AI on the ethical and legal challenges of training.

Table 3: Level of influence of AI on ethical and legal challenges in training

		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	Very low	4	0,7	0,7	0,7
	Low	50	8,9	8,9	9,6
	Just	428	76,3	76,3	85,9
	High	79	14,1	14,1	100,0
	Very high	561	100,0	100,0	

More than two thirds of the students in each specialty demonstrated a high level of impact of learning with artificial intelligence (Table 4). In addition, the analysis of the percentages of the level of impact indicated that the highest values corresponded to the specialties of Pharmacy and Veterinary Medicine, with 79.5% and 79.1%, followed by Nursing with 74.7% and Dentistry with 67.1%.

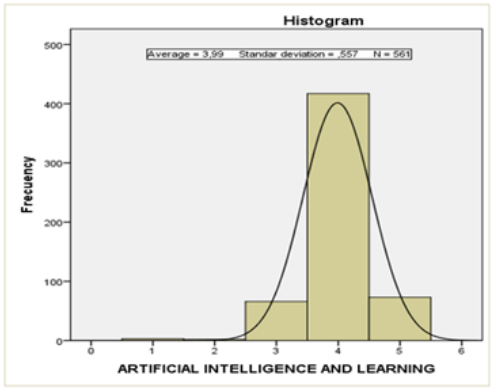
Table 4: Level of impact of artificial intelligence learning in the training of undergraduate students in health sciences by specialty

			Artificial Intelligence learning impact level					Total
			Very low	Low	Just	High	Very high	
Specialty	Nursing	Amount	-	-	24	109	13	146
		%	-	-	16,4	74,7	8,9	100,0
	Pharmacy	Amount	-	-	10	124	22	156
		%	-	-	6,4	79,5	14,1	100,0
	Dentistry	Amount	3	2	27	116	25	173
		%	1,7	1,2	15,6	67,1	14,5	100,0
	Veterinary Medicine	Amount	-	-	5	68	13	86
		%	-	-	5,8	79,1	15,1	100,0
Total		Amount	3	2	66	417	73	561
		%	0,5	0,4	11,8	74,3	13,0	100,0

The level of impact of artificial intelligence learning in the training of university students in health sciences is mainly high (Figure 1), which was confirmed in the distribution of results that have mean, median and mode of 4, which corresponded to the rating of high (Figure 1a). Also, according to the descriptive statistical analysis, 74.3% of the students demonstrated a high perception that with the application of artificial intelligence the level of learning achieved was high (Figure 1b).

		Frecuencia	Porcentaje	Porcentaje válido	Porcentaje acumulado
Válido	Muy bajo	3	0,5	0,5	0,5
	Bajo	2	0,4	0,4	0,9
	justo	66	11,8	11,8	12,7
	Alto	417	74,3	74,3	87,0
	Muy alto	73	13,0	13,0	100,0
	Total	561	100,0	100,0	

a)



b)

Figure 1: Statistical analysis of the response to the level of perception of the impact of artificial intelligence learning on the training of university students in health sciences. a) Mean, median and mode of distribution of the responses to the level of impact of artificial intelligence learning on the training of university students in health sciences. b) Frequency histogram of the distribution of responses to the level of impact of artificial intelligence learning on the training of university students in health sciences.

DISCUSSION

The findings of this study provide strong evidence for the important influence of AI in the training of health sciences students. Most students demonstrated a high level of perception of AI to both improve clinical diagnosis, personalize learning, and consider ethical and legal challenges. These results are consistent with previous studies highlighting the transformative potential of AI in medical education and practice.[27]

AI, when integrated into advanced diagnostic tools, has not only optimized learning, but also improved clinical accuracy, which is particularly relevant in fields such as Dentistry and Radiology, as highlighted.[11,12]

The perceived high level of impact on the personalization of learning is aligned with research highlighting how AI can tailor educational content to the individual needs of learners, with the optimization of teaching efficiency and effectiveness.[19,28,29,30]

The above suggests that technological advances are not only transforming clinical practice but also pedagogical methods, which can improve academic and clinical outcomes in an increasingly automated learning environment. As AI continues to evolve, its ability to provide personalized solutions could play a key role in future medical education, as seen in previous studies in Dentistry and Veterinary Medicine.[4,21]

On the other hand, ethical and legal challenges remain a central concern. 76.3% of students perceived a significant influence of AI in understanding and addressing these issues, highlighting the need to better prepare future healthcare professionals to deal with the legal and ethical implications arising from the use of advanced technologies. This finding is in line with work, which underscores the importance of developing a robust ethical and legal framework to accompany the integration of AI into healthcare.[31] It is crucial that educational programs include specific training on these issues to mitigate potential risks related to data privacy and algorithmic bias.

A noteworthy finding is that Pharmacy and Veterinary specialties presented the highest levels of AI learning impact which could be related to the nature of these fields, where technological tools and large volumes of data have special relevance.[1,4,5,6]. However, this may also indicate differences in how different disciplines are incorporating AI into their curricula, suggesting the need to a more closely evaluate how this technology is implemented in each area of study.

Overall, the results of this study confirm that AI has a remarkably positive impact on the training of health sciences students, especially in terms of diagnostics, personalization of learning, and awareness of ethical and legal challenges. As it continues to develop, it is critical that educational institutions adapt their programs to take advantage of these technologies in a sustainable, inclusive and equitable manner. Only this will ensure that future healthcare professionals are adequately prepared for the challenges and opportunities presented by AI in healthcare.

CONCLUSIONS

AI is a technology with considerable potential. However, it is necessary to keep a watchful eye on its real impact in order to achieve a correct evaluation and application. Hence, it is imperative to develop studies such as the one described above to evaluate its perception in various population groups, such as students of health careers, from which it will be possible to draw defined and contextualized strategies in the health area. All this, in turn, will have an impact on adequate technological literacy with respect to AI and, as a consequence, greater exploitation and balanced employment, with less risk of technological dependence.

RECOMMENDATIONS

Rethink the pedagogical strategies employed, as well as the channels of communication with workers and design training processes considering the socio-cultural characteristics of the working population, with accessible, contextualized methodologies focused on the transformation of everyday practices. Promote a culture of prevention, the strengthening of information systems and the generation of safe work environments as shared responsibilities to achieve sustainable impacts.

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Conflicts of interest:
The authors declare that there are no conflicts of interest.

Authors' contributions:
Carmen Luisa Chauca Saavedra: conceptualization, formal analysis, fund acquisition, research, methodology, project management, resources, writing-revising and editing
Maritza Elizabeth Arones Mayuri: data curation, research, original drafting-drafting, drafting-revising and editing
Virgilio Cenicio Quispe Nombreras: research, methodology, validation, original draft, drafting and editing
Santos Humberto Olivera Machado: visualization, methodology, original draft-writing, drafting-revising and editing

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