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RCSI

Use of technology in research among medical students at a private university in Huancayo

Uso de las tecnologías al servicio de la investigación por estudiantes de medicina de una universidad privada de Huancayo

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ABSTRACT

This study mainly assessed the level of technology use in research among medical students during the infodemic period at a private university in Huancayo. A quantitative, descriptive study was conducted with a randomly selected sample of 109 students from a total population of 764. A validated technology usage scale for research was applied, followed by a descriptive data analysis. The results indicated that 44.95% of students had a basic level of technological proficiency, 45.87% had an intermediate level, and only 8.26% had an advanced level. The most frequently used tools were PubMed and SciELO for literature searches, whereas the use of reference managers and academic integrity tools was notably limited. The findings suggest that despite having access to digital devices and internet services, students require further training in advanced technological tools to enhance the quality of their research.

Keywords: competencies; education; infodemic; research; technology

RESUMEN

El objetivo de este estudio fue identificar el nivel de uso de las tecnologías al servicio de la investigación por parte de estudiantes de medicina en tiempos de infodemia en una universidad privada de Huancayo. Se realizó un estudio cuantitativo, descriptivo simple, con una muestra de 109 estudiantes seleccionados aleatoriamente de una población de 764. Se aplicó una escala de uso de tecnologías para la investigación y se realizó un análisis descriptivo de los datos. Los resultados indicaron que el 44,95% de los estudiantes tenía un nivel básico, el 45,87% un nivel intermedio y solo el 8,26% un nivel avanzado en el uso de tecnologías. Las herramientas más utilizadas fueron PubMed y Scielo para la búsqueda de información, mientras que el uso de gestores de referencias y herramientas de integridad académica fue limitado. Se concluye que, aunque los estudiantes cuentan con acceso a dispositivos y servicios de internet, existe una necesidad de fortalecer sus habilidades en el uso de tecnologías avanzadas para mejorar la calidad de sus investigaciones.

Palabras clave: competencias; educación; infodemia; investigación; tecnología.

1. INTRODUCTION

In recent years, the COVID-19 pandemic has fueled the rise of an infodemic, characterized by the rapid spread of all types of information, including rumors and unreliable data. This has been facilitated by the widespread use of mobile phones, social networks, the internet, and other communication technologies (Arroyo et al., 2020). However, technology use is not inherently detrimental. We are experiencing a technological revolution marked by the global expansion of computers and digital communication systems (Grande et al., 2016), which have proven invaluable across various fields, including scientific research. Information and Communication Technologies (ICTs) exemplify this transformation, significantly impacting research by enabling more efficient problem-solving and data management (Grande et al., 2016). Medical students increasingly rely on ICTs to streamline research tasks that would otherwise be time-consuming and resource-intensive (Arbeláez, 2014).

A 2019 study in Spain by García & Cantón (2019) reported that nearly all students (98%) used search engines such as Google or Safari, and 96% utilized instant messaging applications like WhatsApp or Telegram. In Mexico, Gómez (2019) found that only 18% of university students had internet access at home, with financial constraints being the primary barrier. Social media use was also widespread, with 95% of students on Facebook, 79% on Twitter, and 65% on Instagram. Similarly, Campos et al. (2018) reported that 72.4% of students at a Mexican research center were familiar with ICTs, with an average competence rating of 3.54 on a scale of 1 to 5. A 2017 study in Chile by Cerda et al. (2017) found that 97% of surveyed students owned a laptop and 87% had a smartphone, with extensive internet coverage at home.

In Peru, Morales (2020) examined ICT integration in video surveillance in Santiago de Surco, noting a lack of system interoperability. Mendoza (2018) found that 70.4% of educators incorporated ICT into their teaching, mainly through images (69.1%), videos (64.2%), and audio (44.4%), with PowerPoint being the most frequently used tool (93.8%). However, 38.3% of teachers reported insufficient training and requested instruction on virtual classroom design. Licona & Veitya (2019) further emphasized the necessity of technological training for researchers, highlighting its role in accessing and managing scientific information.

Given the transition to virtual learning environments, evaluating the extent of technology use in research among medical students during the infodemic is crucial (Al-Hail et al., 2023; Almufarreh & Arshad, 2023). ICTs have become essential in both in-person and remote education (Licona & Veitya, 2019), enhancing research quality by facilitating access to databases, data processing software, academic writing tools, presentation applications, plagiarism detection programs, and reference management systems. Recent studies have demonstrated a direct link between students' technological competencies and the effectiveness of their academic research (Martínez & Flores, 2021; Reyes et al., 2020).

Furthermore, Navarrete Enríquez et al. (2024) and Salguero Alcalá et al. (2024) underscored the importance of digital competencies for academic performance, particularly in information-dense environments like the infodemic. These studies highlight the necessity of integrating educational strategies to strengthen students' technological skills, enabling them to efficiently manage information and enhance research quality.

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Thus, the objective of this study is to identify the level of technology use in research among medical students at a private university in Huancayo during the infodemic period.

2. MATERIALS AND METHODS

2.1. Type and area study

A quantitative, descriptive, cross-sectional study was conducted among medical students. The area where the study was conducted was the Peruvian University of Los Andes. It was carried out from September 2021 to January 2022.

2.2. Population and sample

The study population consisted of 764 students of the Faculty of Human Medicine of the Universidad Peruana Los Andes, and the sample consisted of 109 students to whom a scale of use of technologies in the service of research was applied, performing a descriptive analysis. The inclusion criteria considered students who were doing research work, those between the fifth and twelfth year of studies, and all students who expressed their willingness to participate. Students who were between the first and fourth cycle of studies were excluded from the study, as well as those who did not adequately complete the questionnaire (Table 1).

Table 1. neral characteristics of the sample of medical students

General characteristics	n=109	
	fi	%
Demographic characteristics		
Age group (years)		
Teenagers (15-19)	87	79,82
Youth (20-25)	20	18,5
Adults (>25)	2	1,83
Sex		
Male	48	44
Female	61	56
Academic characteristics		
Cycle of studies		
Fifth cycle	15	13,8
Sixth cycle	22	20,2
Seventh cycle	23	21,1
Eighth cycle	9	8,3
Ninth cycle	22	20,2
Tenth cycle	8	7,3
Eleventh cycle	9	8,3
Twelfth cycle	1	0,9
Characteristics of the research		
Type of study		
According to the researcher's intervention		
Observational	106	97,2
Experimental	3	2,8
According to the source of information		
Retrospective	73	67
Prospective	36	33
According to the number of measurements		
Transversal	104	95,41
Longitudinal	5	4,59
According to the number of variables		
Descriptive	95	87,16
Analytical	14	12,84

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Project phase		
Planning	95	87,2
Execution	11	10,1
Final report	3	2,8
Publication	0	0
Informative data		
Previous scientific publication		
Yes	2	1,8
No	107	98,2
Type of study		
Original article	-	-
Letter to the editor	-	-
Editorial	-	-
Review article	2	1,8
Symposium	-	-
Case report	-	-
Essays	-	-

2.3. Data collection techniques and instruments.

The online survey technique was used, using the "Scale of the use of technologies in the service of research" as an instrument. This instrument was composed of 49 items distributed in 7 dimensions: technology for information search, database technology, technology for data processing, technology for writing, technology for the presentation of research results, technology for academic integrity, and technology for reference managers. In addition, a survey guide was applied to collect the general characteristics of the sample, which consisted of 13 items organized into 4 dimensions: demographic characteristics, academic characteristics, research characteristics, and informational data (Table 2).

Table 2. Characteristics of the use of technologies by medical students

Equipment and/or devices	N=109			
	Yes		No	
	fi	%	fi	%
Desktop computer	93	85.32	16	14.68
Laptop	61	55.96	48	44.04
Cell phone	95	87.16	14	12.84
Tablet	49	44.95	60	55.05
Printer	82	75.23	27	24.77
External memory	28	25.69	81	74.31
USB	81	74.31	28	25.69
MP4	44	40.37	65	59.63
Other	-	-	-	-
Internet service				
Home Internet (Router)	100	91.74	9	8.26
Mobile Internet	65	59.63	44	40.37
Wireless Internet (Modem)	87	79.82	22	20.18
Other	-	-	-	-

The "Scale of the use of technologies in the service of research" was validated by a panel of 5 experts, who evaluated the pertinence, relevance, clarity, and organization of the items, ensuring that they were representative of the variable to be measured. The survey was conducted using the Google Forms platform.

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2.4. Data collection procedures

For data collection, the online survey was sent through the WhatsApp messaging application to different groups of students, previously organized by academic cycles (from 5th to 12th). The survey was designed to be answered in an average time of 20 minutes, to ensure the participation and adequate dedication of the respondents.

The process of constructing the instrument began with the development of a matrix in Microsoft Word, in which the items and dimensions of the survey were clearly defined. Subsequently, this matrix was transferred to the Google Forms platform, where the questionnaire was developed in its final format. This digital transition allowed for greater organization and accuracy in data collection, as well as a more accessible experience for participants. In addition, the use of Google Forms facilitated the collection and secure storage of responses, allowing for efficient management of the data collected and minimizing the risk of data entry errors.

The distribution of the survey via WhatsApp was strategically planned to maximize the response rate, taking advantage of the popularity and reach of this application among university students.

2.5. Data analysis

Data collection was carried out through an online survey distributed via institutional email and academic platforms. The survey responses were recorded and analyzed using descriptive statistics, including frequency distributions, means, and standard deviations. The collected data were processed using SPSS version 26.

2.6. Ethical aspects

Before initiating the study, permission was obtained from the Universidad Peruana Los Andes, ensuring institutional conformity with the research. Prior to the application of the survey, participants were asked to provide informed consent virtually, in which the purpose of the study, the intended use of the information collected and their rights as participants were explained clearly and in detail, including their freedom to withdraw their participation at any time without negative consequences.

At all times, the protection of the confidentiality of respondents' personal data was guaranteed. To this end, specific measures were implemented, such as the use of anonymous identifiers and encryption of information, minimizing the risk of unauthorized disclosure. In addition, a strict commitment was maintained with the regulations and guidelines established in the Code of Ethics for Scientific Research of the Universidad Peruana Los Andes, which ensured respect for the integrity of the participants and transparency in all phases of the study.

Compliance with these ethical principles was essential to preserve the confidence of the participants and ensure the validity and reliability of the data obtained. Likewise, specific protocols were established for the management of any ethical situation that might arise during the development of the research, ensuring a safe and respectful environment for all those involved.

3. RESULTS

The results of this study show that the majority of medical students at a private university in Huancayo are in the planning phase of their research, being mostly adolescents and with a slightly higher female representation. The nature of the studies they conduct is predominantly

observational, retrospective, cross-sectional and descriptive, indicating a basic approach to information collection and analysis. In addition, it is observed that, although the students have access to appropriate technological devices and Internet services, their level of mastery in the use of specific technologies for research is mostly basic or intermediate (Table 3).

The study found that 44.95% of students had a basic level of technological proficiency, 45.87% demonstrated an intermediate level, and only 8.26% possessed an advanced level (Table 4). Information search, database, and presentation technologies were the most used, with tools such as PubMed and Scielo standing out. However, limited use of advanced tools for academic integrity and reference management was observed, indicating areas for improvement in the management of essential technologies for research.

Table 3. Dimensions of the use of technologies in the service of research by medical students

Dimensions	N=109									
	Usage				Leve lof use					
	Yes		No		Basic		Intermedia te		Advanced	
	fi	%	fi	%	fi	%	fi	%	fi	%
Information search technology	109	100	-	-	47	43.12	54	49.54	8	7.34
Database technology	107	98.17	2	1.83	48	44.04	52	47.70	9	8.26
Data processing technologies	109	100	-	-	43	39.45	50	45.87	16	14.68
Writing technologies	106	97.25	3	2.75	51	46.79	50	45.87	8	7.34
Presentation technologies	109	100	-	-	40	36.7	52	47.71	17	15.6
Academic integrity technologies	92	84.4	17	15.6	52	47.71	50	45.87	7	6.42
Reference manager technology	91	83.49	18	16.51	55	50.46	45	41.28	10	9.17

Table 4. Use of technologies in the service of research by medical students

Level of technology use	N=109	
	fi	%
I do not use	1	0.92
Basic	49	44.95
Intermediate	50	45.87
Moving forward	9	8.26

These results coincide with the findings of Salguero Alcala et al. (2024), who found that 27% of the students evaluated had a low level of digital competencies, similar to the finding of 44.95% at the basic level. However, unlike studies such as those of Navarrete Enríquez et al. (2024), which identified 73% of students with high digital competencies, the present study reveals a significant gap in the advanced use of technologies, which underlines the need for specific training interventions.

Likewise, Alamo & Montenegro (2022) reported that nursing professionals possess basic knowledge and skills in ICT, aligning with the finding of a high percentage of students with basic and intermediate levels in the use of technologies. This limited level of competence could be associated with the lack of specific training in the management of advanced tools, such as reference managers and academic integrity tools, crucial for the quality of scientific research (Licona & Veitya, 2019).

On the other hand, Llanos de Tarazona (2019) demonstrated that an effective integration of ICTs in university education improves students' research competencies, which highlights the importance of strengthening these skills in the context of the present research. In addition, Gómez (2019) found that access to technologies does not necessarily translate into effective use for academic purposes, corroborating that, despite the high availability of devices and internet among participants, the use of advanced tools is still deficient.

In line with the studies of Mendoza & Placencia (2018), who pointed out that the use of ICT in teaching requires adequate teacher training, the results suggest that current pedagogical strategies may not be sufficiently focused on the development of advanced technological competencies among students. This is especially relevant in times of infodemic, where the ability to manage and critically evaluate information is fundamental for academic research (Reyes et al., 2020).

In addition, Martinez & Flores (2021) highlighted that during the pandemic, virtual training has exacerbated inequalities in access to and use of technologies, which may be reflected in the varied technological competence observed in the sample. The lack of advanced skills in research technologies may limit the effectiveness and quality of research projects developed by medical students.

Cerda et al. (2017) found that the use of digital technologies is positively related to academic achievement in student teachers, suggesting that greater technological competence could improve academic performance in health careers such as medicine. However, Martínez Pérez et al. (2023) observed that excessive use of social networks, such as Facebook, can negatively affect academic performance, underscoring the need to balance the use of technologies for recreational and academic purposes.

Alemán & Ynojosa (2024) warn about the threats and disadvantages of ICT use in academic training, suggesting that ICTs have not been adequately exploited due to a lack of technological skills or insufficient methodological information. Mendoza (2024) also points out that 67% of students experienced problems related to the management and mastery of virtual platforms, which could be linked to a lack of training in these areas.

In this context, the results reveal the need to strengthen the technological training of students, integrating a progressive approach that allows them to develop advanced competencies in the use of technologies applied to research. Comparison with previous studies suggests that the level of technological competence of students varies considerably according to the institutional context and the pedagogical strategies implemented, which highlights the importance of a timely educational intervention to close this gap.

Finally, the integration of advanced digital competencies would not only improve the quality of academic research, but also prepare future medical professionals to deal more effectively with the challenges of the infodemic, characterized by the overabundance and variable quality of available information (Arroyo et al., 2020).

Among the limitations of this study is the fact that the sample consisted of students from a single private university in Huancayo, which may limit the generalizability of the findings to other institutions or regions of the country. In addition, the scale used to measure the use of technologies may not have exhaustively captured all relevant dimensions in the context of academic research.

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The quantitative approach, on the other hand, may have restricted the exploration of qualitative aspects that could provide a deeper understanding of students' experiences with technologies. Another important limitation is the use of virtual surveys, as unequal access to the internet and the possible unfamiliarity of some students with digital platforms could have affected the accuracy and completeness of responses, introducing bias in data collection.

It is recommended that the scope of the study be broadened to include samples of students from different universities, both public and private, and in different regions of the country, in order to obtain a more representative view of the use of technologies in the service of research. In addition, the development of more detailed and specific measurement instruments that can comprehensively evaluate the use of technologies in academic contexts is suggested. It would also be valuable to incorporate qualitative approaches to explore perceptions, motivations and barriers faced by students when using technological tools in their research. Finally, it is recommended to design and implement continuous training programs aimed at improving students' technological competencies, especially in the use of reference managers and academic integrity tools

CONCLUSIONS

Most medical students at a private university in Huancayo reach basic or intermediate levels in using technological tools for research. Despite having access to internet devices and services, there is limited use of advanced and specific tools such as reference managers and academic integrity. These findings underline the need to implement training strategies focused on improving the mastery of critical technologies for academic research, which will allow us to face more effectively the information overload in the infodemic era.

FINANCING

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest related to the development of the study.

AVAILABILITY OF DEPOSITED DATA

The datasets collected during this study and supporting the findings of the study are available at: https://data.mendeley.com/datasets/w9znxg38bw/1

AUTHORSHIP CONTRIBUTION

Conceptualization; Data Curation; Formal Analysis; Research; Methodology; Visualization; Validation; Writing - original draft; Writing - revision and editing: Ruiz-Aquino, M., Osorio-Llancachagua, A. L., Botiquín-Encarnación, J. O., Diaz-Lazo, A. V., Cortez-Orellana, S. Á., and Duran-Aquino, R. C.

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