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Emerging Technological Tools and Post-Pandemic Academic Performance in College Students

Diaz Hinostroza Mary Rosaura[1], Cerna Gonzales Carlos Hector[2], Sosa Daniel Alberto[3], Aranda Dextre Carmen Cristina[4], Borja Torres Rolando Juan[5], Luz Petronila Blas Montenegro[6], Manco Chávez José Antonio[7]

Abstract

Emerging technological tools have grown over time, especially during the pandemic, when it became evident how they increased their usefulness within the professional and educational environment, due to the need to maintain the continuity of their professional and academic activities. The objective of this study was to determine the relationship between the use of ICT and post-pandemic academic performance in students at a University of South Lima; the methodology used was of basic type and with a cross-sectional and correlational quantitative approach, using a survey with Likert scale applied to 146 students and whose data were processed with the SPSS statistical program to analyze the Pearson correlation between the variables. The results showed a positive and significant correlation of 0.00, with a Pearson correlation coefficient of 0.648 between the use of ICT and academic performance, this is how these results validate and support previous research, the findings affirm that most students present an optimal performance while they use emerging technologies tools, however, there are other findings that present a high percentage of students with a poor use of ICT associated with low academic performance, despite these results, there is still a wide path of research to further explore both variables and the factors involved.

Keywords: *ICT, Academic Performance, Digital Gap, Student Assessment, Emerging Tools.*

Introduction

After the pandemic, it has become evident the benefits that technologies are leaving in society, changing the traditional concept that was put into practice in both the professional and educational field, this is due to the fact that now universities, schools and all media related to academic training persist and insist on continuing with the use of technological tools (Zevallos, 2023; Gómez, 2014). This set of resources, originally developed in order to enable the fluidity of virtual communication, enhance learning and facilitate the exchange of information with other people; has experienced a rapid and remarkable growth since the pandemic event of COVID-19, performing as an accelerator for the massive reception of these electronic devices, and their respective tools, such as laptops or desktops, cell phones, tablets or any other device connected via the internet (Molinero & Chávez, 2020). According to Montalvo et al. (2022), during the period of health crisis, the educational system was supported by the establishment of virtual environments and educational platforms carried out by the governmental state as preventive measures, and likewise, applications that at that time were used with less relevance, became an essential part in the development of learning and their use has been increasing over time until reaching today's digitized world.

In this sense, the problematic reality that motivates this research focuses on the current educational context of a university in southern Lima, with relevant implications at the national level. According to INEI (2024), it reveals that, during the last quarter of 2023, a considerable part, especially among the group of young

[1] Universidad Nacional Tecnologica de Lima Sur (UNTELS), Email: mdiazh@untels.edu.pe, https://orcid.org/0000-0001-5139-0617,
[2] Universidad Tecnologica del Perú., Email: E24244@utp.edu.pe, https://orcid.org/0000-0001-6594-7623
[3] Universidad Autonoma del Perú, Email: dsosa21@autonoma.edu.pe, https://orcid.org/0009-0006-6762-870X
[4] Universidad Nacional Mayor de San Marcos, Email: carandad_ac@unmsm.edu.pe, https://orcid.org/0000-0002-9769-7961
[5] Universidad Autonoma del Perú, Email: rborjat@autonoma.edu.pe, https://orcid.org/0000-0002-5906-6640
[6] Universidad Católica Sedes Sapientiae , Email: lblas@ucss.edu.pe, https://orcid.org/0000-0002-9405-2877
[7] Universidad Autonoma del Perú, Email: jmanco15@autonoma.edu.pe, https://orcid.org/0000-0001-9659-6037

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people within the age range of 6 to 24 years, use digital tools with Internet access for communication or for leisure activities, compared to a smaller percentage who use it to obtain information.

In line with these statistics, the data provided during the same quarter on internet connection through devices has increased significantly, showing that a large proportion of the population uses the internet through mobile devices, while a minority connects through laptops and/or computers, where it stands out that internet connection via cell phones is especially high among users with university education.

Internationally, several organizations are committed to addressing the challenges and opportunities of ICT in education. The IESALC Institute (2023) supports these efforts through research aimed at strengthening institutional capacities and improving educational practices so that students gain confidence in their ability to navigate and become empowered in a fully digitized environment. In addition, the World Bank and the Inter-American Development Bank (2023) formed a strategic alliance to boost digital development in the region, with the goal of implementing connected schools available to all young people, with the access needed to bridge the digital gap and ensure educational prosperity in a digital future.

The OAS and ProFuturo (2023) emphasize that information and communication technologies can transform teaching and learning in educational centers. In this line, the mapping carried out by the OAS (2023) shows that 9% of all the Good Practices registered come from Peru, which places it among the five countries with the highest number of registrations and indicates a strong participation of Peruvian organizations in the implementation of educational and technological innovations.

Finally, the OECD (2020) stresses that both teachers and students must be prepared and possess a basic mastery of digital skills and go beyond knowing how to use digital tools, it is crucial that teachers implement them in a didactic and effective way in the learning process to improve academic performance, since if teachers are highly trained to meet the challenges of the digital environment efficiently, then students will also be, to develop their own digital skills and improve their academic performance.

At the national level, Ubillus (2021), highlights the importance of teacher training and the alignment of technological tools with educational objectives, carrying out an investigation in Lima to explore the connection between the use of technological resources and the academic performance of students, at the end of the study there was a considerable use of technological resources by them, however, no direct influence on their academic performance was found.

On the other hand, Ortega (2021) conducted a research in Callao using a hypothetical, deductive and historical review method, to investigate how the use of technologies affects the academic performance of students, and at the end of the search it was obtained as a result a positive correlation, determining a high level of satisfaction when using these technological tools.

In contrast, Norberto (2019) conducted a study in Huánuco with a quantitative approach, framed in a correlational design and characterized as basic cross-sectional research; during an exhaustive process of data collection and analysis, it was determined that there is an inverse correlation, which means that a clear and significant relationship between the use of digital tools and academic success of students in that institution was not identified.

Similarly, Garcia (2022) carried out an investigation in Tumbes, it was a basic study with a quantitative-correlational type, focusing on identifying the possible relationship between the use of ICT and the academic performance of students, in this research the hypothesis was validated as null, discarding it, and consequently, an inverse correlation was observed between the variables determined.

Within the local research we have SUNEDU (2020), which establishes standards to ensure that online educational programs are of high quality, proposing that university centers have a good technological infrastructure to improve online learning, making it more efficient and reliable, also suggest s adequate training of teachers in the use of technology and virtual platforms.

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In collaboration with PlayTec Edu, CONCYTEC (2020) implemented training workshops for all teachers nationwide to improve their skills in the use of digital tools and teaching through application projects with virtual platforms.

To increase efficiency in the use of digital tools, UGEL (2022) promoted the use of ICT in teachers, highlighting that the implementation of these tools has allowed them to reach all students remotely achieving it through this training, allowing young people to know, understand and master these technologies, thus facilitating a significant improvement in their learning process.

In order to promote digital transformation in education, MINEDU (2022) carried out an event called II TECNOTIC, with the aim of strengthening knowledge and improving management on the use of various technological platforms and tools in schools, and training teachers to integrate these technologies effectively in their teaching practices, thus improving the quality of student learning.

Following this approach, the question of the purpose of the research arises; to understand the relationship between the two variables proposed during the approach of the research topic, considering that digital technologies can provide opportunities for the development and improvement of technological competencies in higher education students, in addition, the study aims to understand how the use of these digital tools influence higher education students, allowing to obtain a more detailed view on the positive and/or negative points of the relationship between these two variables, likewise, this research aims to contribute to the already existing knowledge on the use of technological tools in higher education, providing significant information to positively influence decision making at an academic level.

Theoretical Framework

Within the theoretical framework, it is fundamental to understand how technological development, from the creation of the printing press in the 15th century to the evolution towards digital books in the 21st century, has radically changed the accessibility and the way we access information (Duelo, 2019). Currently, e-books allow carrying a complete library on devices such as computers or tablets, thus facilitating access to a vast amount of knowledge in a portable and convenient way, in this sense, students today have access to resources that were unthinkable a few decades ago, such as exploring texts in very different ways and creating their own learning paths (Espinosa, 2021) and (Galvis, 2022).

Digital tools are transforming education; the knowledge transmitted through these digital devices is rapidly evolving, facilitating its sharing through collaborative and individual platforms such as wikis, blogs and podcasts (Díaz et al., 2021; Siemens, 2006; Cueva et al., 2019). The use of creative tools allows students to better manage their learning, allowing them to discover and develop meaningful skills to promote their autonomy in the search for information within a virtual and technological environment (Campos & Rivera-Alegre; Nakanichi et al.,2024) and (Bucheli et al.,2023)

The terminological analysis of ICT in education highlights their role as essential technological tools to manage, obtain data and share instant information globally, regardless of the location (Mañas & Roig, 2019; Marquès, 2000). It is important to mention that the arrival and expansion of the internet have greatly changed lifestyles, and society has become increasingly dependent on data and knowledge, thus when this information is properly processed and understood, they are transformed into wisdom (Mañas & Roig, 2019). In this sense, Espinosa (2021) identifies between information, which are data and facts that we can find in books, internet or news, and knowledge, which is understood as the interpretation and application of these data.

Likewise, Bruce & Levin (1997) and Tapia Cortes (2020) propose a taxonomy that classifies technologies according to their use for research, communication, knowledge construction and expression, highlighting how these tools can enhance students' active and collaborative learning. On the other hand, Zambrano & Zambrano brothers (2019) highlight a positive impact with the use of these technological tools, indicating that it promotes collaborative and diverse learning, fostering critical skills and constructive feedback (Bolaño-García; Guevara et al; El Khaymy; Bucheli et al.,2023)

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To better understand what is considered within the use of ICT, it is important to define the first dimension: Digital tool; according to Arriaga et al., (2021) they are made up of technological devices and applications such as cell phones, laptops and virtual platforms like Zoom, Google drive, among others, these tools are used at all levels, whether in elementary, middle school or high school, and in different modalities, thus breaking the traditional concept of the use of boards, markers, flipchart paper, etc. (Huamán-Romaní et al; Huamán-Romaní; Cobos, 2022)

Within the second dimension: Access; Arriaga et al. (2021) define this extension of the word as the freedom to enter and access any internet site, which facilitates access to information from various places or internet sources such as media, blogs, forums, among others. Access branches out into sharing information and making online consultations, which consists of extracting information that satisfies the need and questions of those who use it and share it with their relatives. (Zevallos, 2023)

According to the third dimension: Technology; Arriaga et al. (2021) highlight that during the pandemic both students and teachers were visibly affected, this was because most of them did not master perfectly the use of these technological tools that today are already implemented more frequently, such as Zoom or Meet. Virtually plays a very important role in technology, since a large majority of university students adapt to the use of online methods that facilitate them to meet their needs and academic activities (Zevallos, 2023).

This adaptation to virtual environments raises the question of how to evaluate student performance in this new digitalized context. In accordance with Vivas et al. (2019); (Caballero et al., 2007) and (Willcox, 2011), mention that academic performance is defined as the accumulation of elements that, during the academic training process, influence the learning and achievement obtained by students, which can be evaluated in the short term through the grades obtained during the study periods, or in the long term through the success in the execution of their professional career. Poveda et al., (2023) and Colonio (2017) reaffirm and mention, in a similarity of opinions, that students' performance is defined as the achievement of the goals or objectives set by themselves with respect to the subjects they are taking.

Benítez (2023) and Camarillo (2020), mention Piaget and emphasize that among his contributions the cognitive constructivism is presented, which promotes meaningful teaching in learners, where students understand and comprehend the information by themselves without memorizing, since they are the main agent in the construction of their own learning, so that no one else can do it for them, since the cognitive development is individual and occurs at their own pace.

Now, as we explore the different dimensions that influence academic performance, it is relevant to consider the first dimension: Student role. Gómez & Escobar (2021) define this criterion, within the learning process, as the active participation of students where they are expected to exercise a proactive role in terms of their mental development in the search for new knowledge in studies in which they are involved in a committed manner, showing skills that will contribute to a more meaningful and efficient learning (Real-Delor et al; Romero Cruz; Viveka; De-la-Peña & Chaves_Yuste; Tezén, 2024) and (Fernández et al, 2023)

Within the second dimension: Didactic materials, according to Zevallos (2023) its definition focuses on educational equipment, ranging from textbooks to digital and audiovisual resources, such as slides, projections, Padlet, among others. These elements are determined as essential to favor and improve the teaching process, as well as the educational experience, promoting greater interaction between teachers and students (Campos Saravia et al; Manco-Chávez, 2023) and (Manco-Chavez et al, 2020)

In accordance with the third dimension: Personal factors, Zevallos (2023) emphasizes that this criterion includes characteristics such as personality, interest in their performance, self-motivation and other aspects that play an important role. These aspects can not only affect the academic performance of students but can also help then to keep committed to their goals despite the challenges that may arise along the way, likewise, influence their ability to adapt to new circumstances within their academic career (Poveda et al., 2023; Colonio, 2017).

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Methodology

The methodology adopted in this study is based on a quantitative approach, focusing on numerical measurement and statistical analysis of data to answer research questions and test hypotheses, this involves a process of posing specific problems, supported by a detailed literature review and the construction of a theoretical framework, from this basis hypotheses are derived and tested using an appropriate research design (Hernández & Mendoza, 2018).

The research design is non-experimental and cross-sectional, where variables are not deliberately manipulated, instead, phenomena and variables are observed and measured in their natural context for analysis (Ñaupas et al., 2018).

In terms of population, it refers to the set of participants being studied or analyzed, on the other hand, the sample is a more manageable part of the population, chosen to conduct the research study (Fidias, 2012; Valdivia, 2018). In this investigation, the general population consists of 200 university students, from which a sample of 146 students was chosen.

The technique used was the survey, and the instrument was based on a questionnaire, therefore, to ensure its reliability a statistic called Cronbach's Alpha is used, this coefficient tells us how reliable the answers are on a Likert scale (Ventura & Peña, 2021; Zevallos, 2023). In this sense, the reliability of the questions on the ICTs variable was very high, with a Cronbach's Alpha of 0.906; on the other hand, the reliability of the questions on the academic performance variable was not too different, with a Cronbach's Alpha of 0.861, which indicates that both variables, measured with a total of 18 questions each, are quite reliable.

Similarly, graphs and statistical tools such as Microsoft Excel and SPSS, recognized for their precision in statistical analysis, were used to illustrate and analyze the data collected (Ñaupas et al., 2018). These tools are essential, they allow visualizing the distribution of variables and exploring possible relationships between them with greater clarity and precision.

Results

Table 1

According to the statistical results presented, the p value (significance) is less than 0.05, therefore it is shown that there is a significant relationship between the use of ICT and academic performance, in other words, as long as the adoption of technologies in teaching and learning increases, it tends to observe a better academic performance of students, likewise, it is evident that the result of the Pearson coefficient is equal to 0.648, indicating a high positive correlation between the two variables.

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Table.1 Correlation Between the Emerging Technological Tools and Academic Performance Variables

		EMERGING TECHNOLOGICAL TOOLS	ACADEMIC PERFORMANCE
EMERGING TECHNOLOGICAL TOOLS	Pearson correlation	1	,648**
	Sig. (bilateral)		0.000
	N	146	146
ACADEMIC PERFORMANCE	Pearson correlation	,648**	1
	Sig. (bilateral)	0.000	
	N	146	146

**. Correlation is significant at the 0.01 level (bilateral).

Table 2. Correlation of the Digital Tools Dimension and the Academic Performance Variable

		DIGITAL TOOL	ACADEMIC PERFORMANCE
DIGITAL TOOL	Pearson correlation	1	,558**
	Sig. (bilateral)		0.000
	N	146	146
ACADEMIC PERFORMANCE	Pearson correlation	,558**	1
	Sig. (bilateral)	0.000	
	N	146	146

**. The correlation is significant at the 0.01 level (bilateral).
As shown in the analysis table, the Pearson coefficient is equal to 0.558, which means a moderate positive correlation between the digital tools dimension and the academic performance variable, this means that, as students integrate digital tools as far as possible in their academic activities, a greater positive impact on their performance is observed, likewise, since it is shown that $p=0 < 0.05$, there is enough statistical evidence to reject the null hypothesis, therefore the alternative hypothesis which shows a significant correlation between these variables is accepted.

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Table 3. Correlations of the Access Dimension and the Academic Performance Variable

		ACCESS	ACADEMIC PERFORMANCE
ACCESS	Pearson correlation	1	,566**
	Sig. (bilateral)		0.000
	N	146	146
ACADEMIC PERFORMANCE	Pearson correlation	,566**	1
	Sig. (bilateral)	0.000	
	N	146	146

**. The correlation is significant at the 0.01 level (bilateral).

If $p = 0 < 0.05$, the null hypothesis is rejected and the alternative hypothesis which shows a moderate and statistically significant positive correlation is accepted, this implies that, the greater the availability and access to technological resources, the greater the positive effect on student learning, on the other hand, Pearson's correlation coefficient is equal to 0.566, indicating a moderate positive correlation between the variables analyzed.

Table 4. Correlations of the Technology Dimension and the Academic Performance Variable

		TECHNOLOGY	ACADEMIC PERFORMANCE
TECHNOLOGY	Pearson correlation	1	,486**
	Sig. (bilateral)		0.000
	N	146	146
ACADEMIC PERFORMANCE	Pearson correlation	,486**	1
	Sig. (bilateral)	0.000	
	N	146	146

**. The correlation is significant at the 0.01 level (bilateral).

The significance value less than 0.05 indicates that the null hypothesis is rejected and this implies that there is a significant relationship between technologies and academic performance, at the same time, the Pearson coefficient is equal to 0.486, which indicates a moderate significant correlation, therefore, this suggests that the appropriate use of technologies in their academic activities and learning, can contribute positively in the performance of university students.

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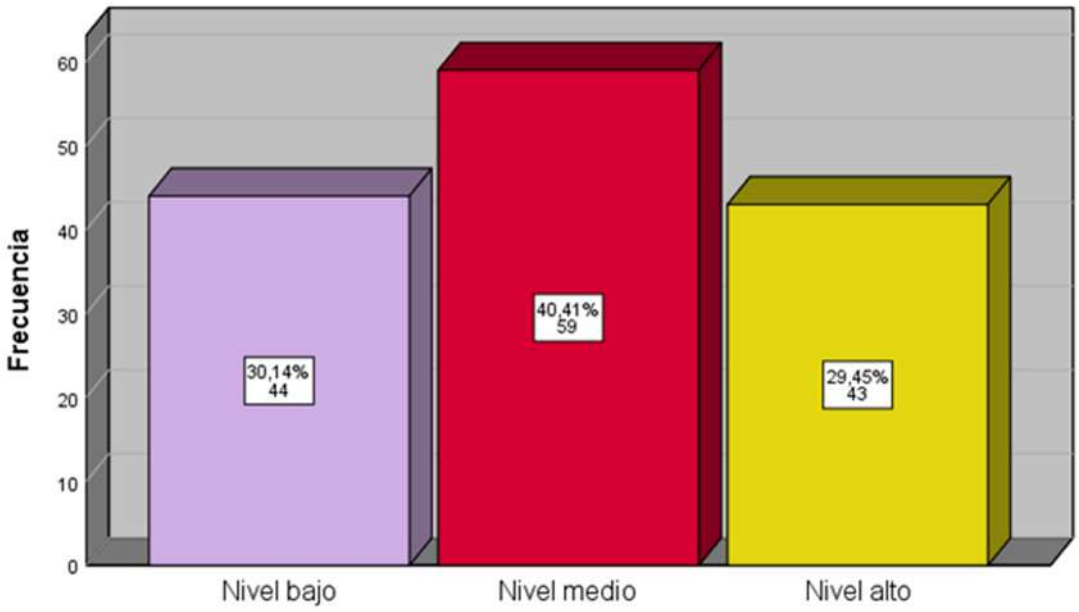
Table 5. Levels of the ICT Use Variable

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Low level	44	30.1	30.1	30.1
	Medium level	59	40.4	40.4	70.5
	High level	43	29.5	29.5	100.0
	Total	146	100.0	100.0	

From table 5, according to levels on the variable ICT use, it was found that 30.1% of the students are in the low level, which is equivalent to 44 students who use ICT, this result suggests greater support or training in the effective use of technologies to improve their academic performance, on the other hand, 40.4% of students, representing the majority of the sample, use ICT at a medium level, while only 29.5% maintain a high level in the advanced use of these information and communication tools.

Image 1

Emerging Technology Tools



The figure shows that, out of a total 146 students, 40.41% use digital technology tools and platforms at a medium level, which represents the majority with 59 students, on the other hand, in a balanced way, there are 44 students at a low level and 43 at a high level, represented by 30.14% and 29.45% consecutively.

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Table 6. Levels of the Academic Performance Variable

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Low level	47	32.2	32.2	32.2
	Medium level	57	39.0	39.0	71.2
	High level	42	28.8	28.8	100.0
	Total	146	100.0	100.0	

From table 6, according to the levels on the academic performance variable, it is shown that a percentage (32.2%), equivalent to 47 students, have an academic performance classified as low, which suggest additional support to improve their academic performance, likewise, a majority percentage (39.0%) of students, which represents most of the sample with a total of 57 students, demonstrate moderate academic performance, unlike, a balanced percentage (28.8%) of students who maintain a high and outstanding academic performance compared to the other levels is shown.

Image 2

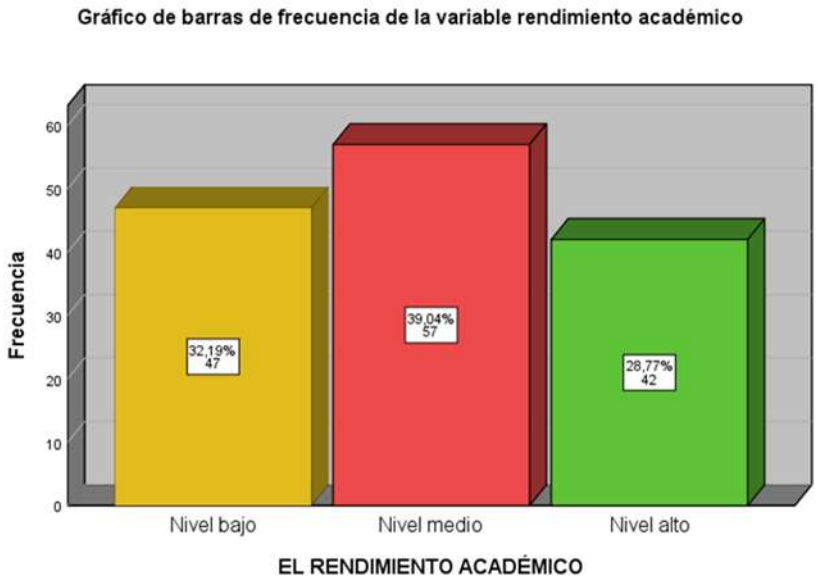

Figure 2 shows that 32.19% of the students have a low performance, which corresponds to 47 students of the total sample, in addition, 57 students show an intermediate level (39.04%) and only 42 stand out with a high performance in their learning (28.77%), these data demonstrate that, in terms of their educational performance, a medium level predominate among students.

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Table 7. Correlations Between Student Role, Didactic Materials, Personal Factors and Emerging Technological Tools Dimensions.

		STUDENT ROLE	DIDACTIC MATERIALS	PERSONAL FACTORS	EMERGING TECHNOLOGICAL TOOLS
STUDENT ROLE	Pearson correlation	1	,476**	,567**	,664**
	Sig. (bilateral)		0.000	0.000	0.000
	N	146	146	146	146
DIDACTIC MATERIALS	Pearson correlation	,476**	1	,530**	,450**
	Sig. (bilateral)	0.000		0.000	0.000
	N	146	146	146	146
PERSONAL FACTORS	Pearson correlation	,567**	,530**	1	,571**
	Sig. (bilateral)	0.000	0.000		0.000
	N	146	146	146	146
EMERGING TECHNOLOGICAL TOOLS	Pearson correlation	,664**	,450**	,571**	1
	Sig. (bilateral)	0.000	0.000	0.000	
	N	146	146	146	146

**. The correlation is significant at the 0.01 level (bilateral).

As shown in Table 7, there is a moderate positive correlation between the role of students and emerging technological tools ($r = 0.664$, $p = 0.000$), this means that the more active and participatory the role played by students, the greater their tendency to use information and communication technologies in their learning, on the other hand, a similar positive correlation was found between the type of teaching resources used and the integration of technologies in the teaching-learning process ($r = 0.450$, $p = 0.000$), finally, between the personal aspects of the students and the integration of technologies as study and work tools, also shows a moderate positive correlation ($r = 0.571$, $p = 0.000$), these results suggest that elements such as motivation, attitudes and individual skills of the students are moderately linked to the way they use information and communication technologies in their learning process.

Table 8. Cross-Tabulation of Emerging Technology Tools and Academic Performance

			ACADEMIC PERFORMANCE	Total

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			Low level	Medium level	High level	
EMERGING TECHNOLOGY TOOLS	Low level	Count	34	9	1	44
		% within ICT USAGE	77.3%	20.5%	2.3%	100.0%
		% of total	23.3%	6.2%	0.7%	30.1%
	Medium level	Count	10	35	14	59
		% within ICT USAGE	16.9%	59.3%	23.7%	100.0%
		% of total	6.8%	24.0%	9.6%	40.4%
	High level	Count	3	13	27	43
		% within ICT USAGE	7.0%	30.2%	62.8%	100.0%
		% of total	2.1%	8.9%	18.5%	29.5%
Total		Count	47	57	42	146
		% within ICT USAGE	32.2%	39.0%	28.8%	100.0%
		% of total	32.2%	39.0%	28.8%	100.0%

The data shown in Table 8, indicate that those students with a low level of the emerging technological tools have a greater probability of obtaining a low academic performance, specifically, 77.3% of the students represent a low level, while only 2.3% achieve a high level, on the contrary, among the students with a medium level, the majority (59.3%) achieve a moderate academic performance, and 23.7% achieve a high level, this trend is even more marked in the group of students with a high level of emerging technological tools, where 62.8% obtain a high academic performance, 30.2% medium and only 7% low, indicating that a greater integration and use of digital technologies in the learning process is positively associated with better academic results.

Table 9. Cross-tabulation of DIGITAL TOOLS*ACADEMIC PERFORMANCE

			ACADEMIC PERFORMANCE			Total
			Low level	Medium level	High level	
DIGITAL TOOLS	Low level	Count	35	13	5	53
		% within DIGITAL TOOLS	66.0%	24.5%	9.4%	100.0%

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		% of total	24.0%	8.9%	3.4%	36.3%
	Medium level	Count	8	30	11	49
		% within DIGITAL TOOLS	16.3%	61.2%	22.4%	100.0%
		% of total	5.5%	20.5%	7.5%	33.6%
	High level	Count	4	14	26	44
		% within DIGITAL TOOLS	9.1%	31.8%	59.1%	100.0%
		% of total	2.7%	9.6%	17.8%	30.1%
Total		Count	47	57	42	146
		% within DIGITAL TOOLS	32.2%	39.0%	28.8%	100.0%
		% of total	32.2%	39.0%	28.8%	100.0%

Table 9, shows how students are distributed according to their level of academic performance based on their use of digital tools, in this sense, it is observed that most of the students who integrate technological tools at a low level, tend to obtain less favorable academic results (66.0%), while only a small percentage (9.4%) achieve high academic performance, on the other hand, with respect to students who make use of technologies to a moderate degree, it is observed that a significant proportion of these students (61.2%) present an intermediate level academic performance, in addition, the distribution of academic results of this group is characterized by being relatively balanced between low (16.3%) and high (22.4%) levels. Finally, students with a high level (59.1%) in the use of digital tools show high academic performance, in contrast, a low percentage (9.1%) represents low academic performance, this indicates an important connection between the degree of employment of technological tools and the academic performance of students, suggesting that a higher use of these tools is associated with better academic performance, while a reduced use may be linked to less favorable results.

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Table 10. Cross-tabulation ACCESS*ACADEMIC PERFORMANCE

			ACADEMIC PERFORMANCE			Total
			Low level	Medium level	High level	
ACCESS	Low level	Count	33	11	5	49
		% within ACCESS	67.3%	22.4%	10.2%	100.0%
		% of total	22.6%	7.5%	3.4%	33.6%
	Medium level	Count	12	36	14	62
		% within ACCESS	19.4%	58.1%	22.6%	100.0%
		% of total	8.2%	24.7%	9.6%	42.5%
	High level	Count	2	10	23	35
		% within ACCESS	5.7%	28.6%	65.7%	100.0%
		% of total	1.4%	6.8%	15.8%	24.0%
Total		Count	47	57	42	146
		% within ACCESS	32.2%	39.0%	28.8%	100.0%
		% of total	32.2%	39.0%	28.8%	100.0%

Table 10 shows a clear relationship between the level of access to technological resources and tools, likewise the academic achievement of students, showing some of them with a low level of access have the same level in academic achievement (67.3%) and very few achieve a high achievement (10.2%), in contrast, students with high access present an opposite pattern, where most students (65.7%) achieve high performance and only a minority obtain low performance (5.7%), this suggests that greater access to technological resources is positively associated with better academic performance, providing a significant advantage in student learning and evaluation.

Table. 11

Cross-Tabulation Technology*Academic Performance

			ACADEMIC PERFORMANCE			Total
			Low level	Medium level	High level	
TECHNOLOGY	Low level	Count	32	20	5	57
		% within TECHNOLOGY	56.1%	35.1%	8.8%	100.0%
		% of total	21.9%	13.7%	3.4%	39.0%

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	Medium level	Count	9	25	12	46
		% within TECHNOLOGY	19.6%	54.3%	26.1%	100.0%
		% of total	6.2%	17.1%	8.2%	31.5%
	High level	Count	6	12	25	43
		% within TECHNOLOGY	14.0%	27.9%	58.1%	100.0%
		% of total	4.1%	8.2%	17.1%	29.5%
Total		Count	47	57	42	146
		% within TECHNOLOGY	32.2%	39.0%	28.8%	100.0%
		% of total	32.2%	39.0%	28.8%	100.0%

Table 11 shows a clear trend that demonstrates how the level of technology used influences students' academic performance. The results show that most students with a low level of technology have a low academic performance (56.1%), while only very few achieve a high level of it (8.8%), which suggests that the lack of access to or use of technology may be contributing negatively to their academic performance. On the other hand, at a moderate level with respect to technology, moderate academic performance is also evident (54.3%), with a more balanced distribution between low (19.6%) and high (26.1%) levels. Likewise, those students who have a high level of technology achieve high performance (58.1%), this highlights that an increase in the use of technology is positively correlated with better academic performance, underscoring the importance of effectively integrating technology into the educational process to improve student learning outcomes.

Discussion

The findings in Table 5 show that a significant number of students use technological tools at medium (40.4%) and low (30.1%) levels, suggesting that, although there is a moderate familiarity with these resources, there is still a significant percentage of students who are at low levels of use. On the other hand, according to the study of Espinoza (2023) it is shown that 84.0% of students are at an advanced level in terms of the use of technological tools, 16.0% are at an intermediate level and the low level does not register any score, this indicates that students in his research present a high mastery of technologies in their academic activities, in other words, the absence of students in the low level highlights the effectiveness of the technological resources implemented in the learning process, likewise, the results obtained in the research determine that students are effectively taking advantage of these tools at their disposal, then, these would be contributing positively in their academic achievements.

In contrast, the data in the cross-tabulation number 8 show a direct relationship between both variables, those with a low level of ICT use are more likely to obtain a low academic performance (77.3%), while only 2.3% achieve a high level, on the contrary, among students with a medium level (59.3%) reach a moderate academic performance, and 23.7% achieve a high level, finally respecting the group with a high level, the majority obtain a high academic performance (62.8%) and only a minority a low level.

Comparing with the study of Zevallos (2023), 31.8% of university students consider that digital technologies are bad and, likewise, present inadequate academic performance, while 17.6% consider that technologies are regular and have adequate academic performance, and 24.7% consider that technological resources are good, at the end of the study, Zevallos concludes that the highest percentage of students (31.8%) maintain a poor use of technologies, which is associated with inadequate academic performance.

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On the other hand, Aliaga (2022) found that, regardless of the level of use of digital technologies, students present different levels of academic performance, with 32.6% expressing high performance, 30.3% moderate performance, and 37.1% low performance.

In summary, the findings of both authors and the data presented in the cross-tabulation show some differences, while in the study of Zevallos an association was found between both variables, specifically detailing that those who consider technological tools as deficient tend to present inadequate performance, on the contrary, those who have a more positive use and knowledge show better academic performance. On the other hand, Aliaga reports that the level of use of technologies is not necessarily related to academic performance, however, the cross-tabulation within the research shows a direct relationship between the level of use of information technologies and academic performance, with a significant proportion in this group of high level of mastery, thus obtaining better academic results.

Regarding the specific results in table number 6, a moderate positive correlation (r=0,558) was found between the digital tools dimension and the academic performance variable, therefore, as students integrate digital technologies to a greater extend in their academic activities, their performance will be higher, in addition, in the cross-tabulation number 10, it is observed that most of the students who use digital tools at a low level tend to obtain less favorable academic results (66.0%),on the other hand students who have a high level in the use of digital tools, also show predominantly high academic performance (59.1%), while only a small percentage (9.1%) present low academic performance, highlighting the importance of using these tools properly to improve student performance.

On the contrary, considering with what is less close, the study by Garcia (2024) identifies a positive, but weak correlation (r=0.300), suggesting that, although there is a relationship, it is not so strong or significant, concluding that improving the use of these digital resources could significantly enhance the performance of academic students.

In contrast, Navarro (2022), found a very strong correlation (r=0.893), suggesting a considerably greater impact of the use of digital tools on academic performance, the data presented highlights that a small percentage (2.1%) of students present deficient academic performance and also use digital tools poorly, in contrast a remarkable 29.8% of students achieve optimal academic performance while using digital tools on a regular basis, furthermore, only 8.5% obtain excellent academic performance as well as an optimal use of digital tools, these findings suggest a positive correlation between effective use of digital tools and better academic performance.

The results of the study of the cross-tabulation number 6, show a clear relationship between the level of access to technological resources (such as mobile devices, university virtual platforms, among others) and the academic achievements of students, in this sense, through the cross-tabulation 11, it was found that those students with a low level of access predominantly present poor academic performance (67.3%), while students with high access to technological resources and platforms show an opposite result, with the majority achieving an outstanding performance (65.7%), this indicates that those with more access to technological tools take better advantage of these opportunities to improve their academic achievements.

Indeed, according to the data obtained in the study of Felix (2022), 37.5% of students consider that the access to digital platforms provided by the university have contributed significantly to achieving their academic goals, in addition, 60% are at a medium level in terms of their academic performance, suggesting that they are still in the process of improving their use of these platforms for their studies, likewise, these findings indicate that as students take advantage of technological tools for academic purposes, they are likely to experience improvement in their learning achievements.

In contrast, the study by Merma & Apaza (2022) highlights a different result, in which most respondents (66.67%) have very low access to and use of virtual tools, while 26.67% are at a medium level, and only a minority of 3.33% reach a high level.

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The differences observed show that simply having access to technological and digital resources does not ensure better academic performance, but rather the effectiveness seems to depend on situational factors, the preparation of the teaching staff, and the willingness of students to use the tools more efficiently and profitably.

On the other hand, the results also evidence a clear trend that illustrates how the level of technology used by teachers and students impacts learners performance in the virtual environment (cross-tabulation 11), the data show that most students with a high level of technology achieve high performance (58.1%), highlighting that an increase in the use of technology correlated positively with better academic performance, in this sense, Román (2021) shows through the research result that 53% of the students surveyed consider that the motivation provided by the teacher in the virtual education plays a crucial role in their learning, which means that it not only encourages engagement and active participation, but also drives students to use technological tools more effectively, which can lead to better academic performance, finally, these findings highlight the importance of properly integrating technologies in the educational process to maximize learning outcomes.

Conclusion

Evaluating the general objective it is found a medium level in the use of ICT, which correlates with a better academic performance, based on these results it is suggested to reinforce and expand the skills that students already possess to progressively maximize the benefits in their learning process, likewise a significant percentage of students with low academic performance when using digital tools was observed, this gives to suggest the implementation of educational strategies and additional support to improve the use of these tools and subsequently successfully achieve an outstanding performance in their academic activities, this implies that a moderate performance associated with limited access to these technologies was found, therefore, it is recommended to improve access to technological devices and platforms, this would enhance academic performance by facilitating access to update information and promote interactive learning between teacher and students, finally it is showed a low performance in the results, which suggests integrating more innovative and adaptive educational technologies in the university infrastructure, as well as within classes, at the same time it is suggested to provide adequate training to teachers to ensure an effective use of these technologies in the classroom, both face-to-face and virtual.

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