Data and Metadata. 2024; 3:216
doi: 10.56294/dm2024216

ORIGINAL

Digital Challenges: The Need to Improve the Use of Information Technologies in Teaching

Desafíos Digitales: La Necesidad de Mejorar el Uso de Tecnologías de la Información en la Docencia

Lida Vásquez-Pajuelo[1], Jhonny Richard Rodriguez-Barboza[2], Karina Raquel Bartra-Rivero[1], Edgar Antonio Quintanilla-Alarcón[3], Wilfredo Vega-Jaime[3], Eduardo Francisco Chavarri-Joo[4]

[1]Universidad Peruana de Ciencias Aplicadas. Lima, Perú
[2]Universidad San Ignacio de Loyola. Lima, Perú.
[3]Universidad Nacional Mayor de San Marcos. Lima, Perú.
[4]Universidad de la Integración de las Américas. Asunción, Paraguay.

Cite as: Vásquez-Pajuelo L, Rodriguez-Barboza JR, Bartra-Rivero KR, Quintanilla-Alarcón EA, Vega-Jaime W, Chavarri-Joo duardo F. Digital Challenges: The Need to Improve the Use of Information Technologies in Teaching. Data and Metadata 2024;3:216. https://doi.org/10.56294/dm2024216.

Submitted: 20-10-2023 **Revised:** 25-12-2023 **Accepted:** 08-02-2024 **Published:** 09-02-2024

Editor: Prof. Dr. Javier González Argote

ABSTRACT

In the post-pandemic scenario, a study was conducted at I.E. 50499 Justo Barrionuevo Álvarez in Cusco, Peru, to investigate the relationship between the use of information technologies and digital competencies among teachers. With a sample of 54 teachers, a structured questionnaire was administered to assess their competencies. The results revealed a direct positive correlation between the use of technologies and digital competencies, with a Spearman's Rho coefficient of 0,877, indicating a significant relationship. Correlations between the use of information technologies and the dimensions of digital competencies ranged from moderate to high. Significant correlations were observed in areas such as problem-solving (Rho=0,457), information and digital literacy (Rho=0,633), and security (Rho=0,743), among others. These findings suggest that, despite limited experience and limited knowledge of digital technologies among teachers in the institution, there is a notable relationship between the use of these technologies and their digital competencies. This study underscores the need for further training in information technologies for teachers in non-modernized urban contexts and for those who are older adults with limited prior experience in the digital domain. Enhancing digital competencies is crucial for adapting to the educational challenges in this new era of education.

Keywords: Competency Assessment; Digital Teaching; Educational Technologies; Teacher Training; Technology Use.

RESUMEN

En el escenario de pospandemia, se realizó un estudio en la I.E. 50499 Justo Barrionuevo Álvarez de Cusco, Perú, para investigar la relación entre el uso de tecnologías de la información y las competencias digitales en docentes. Metodológicamente, el estudio se encuentra bajo un enfoque cuantitativo, no experimental transversal, con una muestra de 54 docentes, aplicándose un cuestionario estructurado para evaluar sus competencias. Los resultados mostraron una correlación positiva directa entre el uso de tecnologías y las competencias digitales, con un coeficiente Rho de Spearman de 0,877, indicando una relación significativa. Las correlaciones entre el uso de tecnologías de información y las dimensiones de competencias digitales variaron de moderadas a altas. Se destacaron correlaciones significativas en áreas como la resolución de problemas (Rho=0,457), información y alfabetización informacional (Rho=0,633), y seguridad (Rho=0,743), entre otras. Estos resultados sugieren que, aunque los docentes de la institución tienen una experiencia

limitada y un conocimiento reducido en tecnologías digitales, existe una relación notable entre el uso de estas tecnologías y sus competencias digitales. Este estudio destaca la necesidad de una mayor formación en tecnologías de la información para los docentes en contextos urbanos no modernizados y para aquellos que son adultos mayores con poca experiencia previa en el ámbito digital. La mejora en competencias digitales es crucial para adaptarse a los desafíos educativos en esta nueva era educativa.

Palabras clave: Enseñanza Digital; Evaluación de Competencias; Formación Docente; Tecnologías Educativas; Uso de Tecnología.

INTRODUCTION

Approximately forty years ago, "new technologies" played a significant role as they were considered the primary source or means of communication. In 1984, the computer was defined as the first metamedium with capabilities for representation and expression, and today, there are various concepts associated with the characteristics and potential of technologies as instructional tools.[1]

The use of ICTs in the field of education, specifically in the teaching and learning process, has brought about a notable change in the structure of education, gaining significant relevance worldwide.[2] This situation has prompted rapid adaptation by both teachers and students to new requirements and emerging models, a shift accelerated by the healthcare crisis resulting from COVID-19, which impacted educational systems globally.

Technologies have become one of the most important tools in education. According to the IV Study on the Use of Technology in the Classroom, conducted by Blink Learning[3] in collaboration with the University Rey Juan Carlos in Spain, Colombia, Mexico, Peru, and Chile, 73,00 % of surveyed teachers stated that they use ICT in their daily classes. The most commonly used technologies in the classroom are digital whiteboards and projectors. Additionally, the study revealed that the primary challenges to address are teacher training (44,00 %), connectivity issues (37,00 %), and the lack of devices for both teachers and students. Only 30,00 % reported receiving ICT training from their educational institutions, while 54,00 % affirmed that the use of ICT increases student motivation.[4]

Over the last decade, various studies conducted in Perú indicate that only 67,90 % of teachers in urban areas and 70,70 % in rural areas received some form of training on the use of computer equipment. Among them, only 49,00 % of primary school teachers report using CRT laptops for an approximate duration of 2 hours (INEI, 2019). According to Blink Learning[3], 37,00 % of teachers from all regions of Peru use ICT in their daily classes, 37,00 % use them several times a week, 14,00 % use them several times a month, 6,00 % use them once a month, 3,00 % use them several times a year, and 3,00 % never use them. It is noteworthy that the main challenges for the introduction of new technologies in the classroom are connectivity (60,00 %), lack of devices (44,00 %), teacher training (33,00 %), student training (32,00 %), control methods (32,00 %), adaptation of the learning process (27,00 %), and usability of content (15,00 %).

Theoretical framework

In Peru, the Ministry of Education has never prioritized national strategies aimed at providing teachers with ICT competencies. This situation became more evident during the COVID-19 pandemic. "Aprendo en Casa," the educational service, was only made possible thanks to the individual efforts of teachers to quickly learn different technological strategies and effectively conduct their classes.[5,6] Therefore, the proper use of technology and computer platforms for knowledge transmission is a crucial point for enhancing educational quality, but it is an aspect that is severely lacking in reality. Additionally, the lack of internet access is a widespread issue in most districts nationwide.[7,8]

Despite the observed conditions at the international and national levels regarding the use of Information and Communication Technologies in education, at the local level, Cusco stands out as one of the main regions with primary and secondary educational institutions equipped with internet access. This includes 18,0 % in primary education and 55,0 % in secondary education. Cusco also surpasses the national average in desktop computer ownership, with 76,8 % in primary education and 93,6 % in secondary education. Furthermore, it ranks eleventh in the possession of multimedia projectors, with 69,1 % in primary and 87,6 % in secondary education. These figures indicate that regional policies focused on the digitalization of education are in progress and implementation.[9]

It is rare for teachers to master ICT in the classroom,[10,11,12] but there are exceptional cases, such teachers who utilizes blogs, podcasts, social media, and websites to teach their students.[13,14] They have received recognition, including the Palmas Magisteriales award from the Ministry of Education and the Educational Innovation award from the Telefónica Foundation. Despite not being a digital native, they have mastered various digital tools as part of their personal initiative and not driven by a national or regional government

policy.[15]

This research was conducted to analyze the relationship between the use of information technologies and digital competence among teachers at a public educational institution in the Cusco region. Despite the widespread implementation of ICT in educational centers in the region, teachers' dissatisfaction or stress[39] with plans or programs to enhance their competencies is concerning.[16,17]

Information and communication technologies originated with the advent of computers and the internet, which facilitated easy access to information.[18,19] This development gave rise to the growing and significant technological society, marking a historical turning point globally. It has had a profound impact on people's lives, reshaping how they interact and revolutionizing the method of acquiring knowledge.[20]

Information and communication technologies (ICT)

The definition of Information and Communication Technologies (ICT) arises from electronics, computer software, and telecommunications infrastructure, establishing itself as a set of technologies that allow users to acquire, produce, store, process, communicate, record, and present information through voice, images, videos, sounds, animations, and data in acoustic, optical, or electromagnetic signals.[21]

On the other hand, Various authors[22,23] refer to it as a term that encompasses all technologies used for the creation, storage, exchange, and processing of information in its various forms, whether it be data, voice files, images, presentations, or others. This definition coincides with [23], indicating that it is the connection between four basic media (computing, microelectronics, multimedia, and telecommunications) that interact and connect, allowing for new forms of communication and enhancing isolated ones.

Taking into consideration the contributions of the aforementioned authors, it is established that ICT is the set of tools, supports, and channels for the processing and access to information, generating new forms of expression, access, and cultural recreation. These tools encompass all accessories and instruments used by teachers and students when acquiring new knowledge.[24]

For this reason, in this document, we decided to propose the analysis of the use of ICT through the following dimensions: (a) Technological, recognizing the capacity of teachers to use ICT software and hardware, through components of knowledge, use, and innovation. (b) Pedagogical, acknowledging how teachers modify their pedagogical knowledge and practices with ICT, through activities such as planning and creating experiences that enable the integration of technologies. (c) Management, associated with the actions of organization, practice, and monitoring of ICT resources and tools. (d) Social, ethical, and legal, analyzing the use of ICT within an ethical paradigm. (e) Attitudinal, studying the disposition of teachers to use ICT, generating reflection on their impact on education.

The inevitable integration of technologies into educational environments and daily life has allowed for the development of digital media and electronic learning environments in which open educational resources and learning objects demonstrate their best educational potential. The knowledge society inevitably leads to technological advances and their constant development, requiring adaptation.[25]

The so-called digital competencies arise from various research studies on technological advances in the field of ICT and their significance in learning, research, recreation, and social aspects, among others. Competencies, from an educational perspective, are considered valuable instruments that enable the movement of attitudes, knowledge, and processes, through which students acquire skills for easy knowledge transfer and innovation.[26]

According to [27], digital competencies should be understood as a set of skills that enable users to use digital devices, communication apps, and networks to access and manage information properly. This includes creating and sharing digital content, effective communication, collaboration, and solving particular problems for effective and creative personal realization, as well as for learning, work, and social activities in general. This definition is similar to the one proposed,[28] which states that it is a set of skills and knowledge that enable individuals to use information technologies safely and efficiently, which are essential in the information societies in which the planet currently operates.

E-skills and their importance in digital education

E-skills, also known as digital competencies, are competencies linked to communication systems, primarily developed through digital devices. They hold particular significance in virtual education, mainly due to the loss of physical interaction between teachers and students.[29] The more teachers invest in their professional development, the richer their knowledge base, skills, teaching methods, and digital tools become. These competencies are essential for understanding and enhancing the education of the new generations of students who are born and grow up in the digital era.[30]

Considering the definitions mentioned above, it is essential to establish that education has undergone a radical paradigm shift, with new technologies dominating almost every field of study.[31,32] Therefore, teachers cannot afford to remain outdated;[33,34] it is crucial for them to empower themselves in the use of technological tools and achieve digital competence. Teachers need to be digitally competent, as they must be skilled and

experienced in the new digital environments, actively participating in the creation of new teaching models, prioritizing the implementation of ICT (Information and Communication Technologies), and digitally literacy for those in need.

Given this situation, the study of digital competencies was structured into five dimensions.[30]

(a) Information: The teacher's ability to identify, store, structure, and examine digital information.
(b) Communication: The teacher stays informed about digital environments, shares resources on the internet, and interacts with other educational communities.
(c) Content Creation: The teacher ethically creates and programs digital content.
(d) Security: Ensuring the protection of information and personal data.
(e) Problem Solving: The teacher identifies problems using computer means, creatively utilizing technology.

In the enchanting city of Cusco, as the year 2023 unfolds, an educational transformation is underway. At the heart of this transformation lies a profound question: How do information technologies intertwine with the digital competencies of the dedicated educators at I.E. 50499 Justo Barrionuevo Álvarez? Our quest delves into the very essence of this question, exploring the intricate relationship between the utilization of information technologies and the proficiency of teachers in the digital realm. In an age where traditional classrooms have seamlessly transitioned into virtual realms, the role of educators in navigating this digital landscape is paramount. These digital competencies, also known as e-skills, have emerged as the linchpin of virtual education. As the boundaries of teaching expand into the digital sphere, educators find themselves at the crossroads of technology and pedagogy.

METHODS

The objective of the study is to identify the relationship between the use of information technologies and digital competencies in teachers from a public educational institution, through basic research, as it solely aims to expand the existing knowledge regarding the research variables.[35] It falls under the descriptive-relational level, as it involved describing the main characteristics of each variable through frequency tables and relational because it seeks to establish the degree of association between the use of information technologies and digital competencies.[36] The population consisted of 54 teachers from both primary and secondary levels, according to the MINEDU's ESCALE system. Due to population conditions, a non-probabilistic census sampling method was chosen, meaning the sample represents the entire population.[37] The survey was employed as the technique, with the questionnaire serving as the instrument, consisting of 60 statements distributed across 10 dimensions and 2 variables.

RESULTS

Determination of the Reliability of Measurement Instruments

Table 1. Reliability Analysis of the Information Technology Usage Measurement Instrument

	N of elements	Cronbach's Alpha
Usage of Information Technologies	30	,841
Technological	6	,682
Pedagogical	6	,872
Management	6	,577
Social, Ethical, and Legal	6	,576
Attitudinal	6	,779

The table presents the results of a reliability analysis for the measurement instrument used to assess the usage of information technologies across various dimensions. The overall instrument, which includes 30 elements related to information technology usage, demonstrated good reliability with a Cronbach's Alpha coefficient of 0,841. Additionally, the dimensions within the instrument, such as Technological, Pedagogical, Management, Social, Ethical, and Legal, and Attitudinal, were also assessed for reliability. Among these, the Pedagogical dimension exhibited the highest reliability with a Cronbach's Alpha of 0,872, indicating strong internal consistency in measuring pedagogical aspects of technology usage. Conversely, the Management dimension showed the lowest reliability with a Cronbach's Alpha of 0,577. These reliability coefficients provide valuable insights into the consistency and stability of the measurement instrument used in the study.

Table 2. Reliability Analysis of the Digital Competency Measurement Instrument

	N of elements	Cronbach's Alpha
Digital Competency	30	,898
Information and Information Literacy	6	,871
Communication and Collaboration	6	,669
Digital Content Creation	6	,603
Security	6	,716
Problem Solving	6	,647

In table 2, the reliability analysis of the Digital Competency Measurement Instrument is presented. The instrument consists of 30 elements, and it exhibits a high level of internal consistency with a Cronbach's Alpha coefficient of 0,898, indicating strong reliability. Additionally, the instrument was divided into five dimensions: Information and Information Literacy, Communication and Collaboration, Digital Content Creation, Security, and Problem Solving, each comprising 6 elements. These dimensions also demonstrate good internal consistency, with Cronbach's Alpha coefficients ranging from 0,603 to 0,871, reinforcing the reliability of the measurement tool for assessing digital competency across these specific areas.

Descriptive analysis of the variable "Use of ICT"

Tabla 3. Level of the dimensions of the variable "Use of ICT"

	Low	Medium	Total
Technological	15	39	54
	27,78 %	72,22 %	100,00 %
Pedagogical	27	27	54
	50,00 %	50,00 %	100,00 %
Management	27	27	54
	50,00 %	50,00 %	100,00 %
Social, Ethical, and Legal	25	29	54
	46,30 %	53,70 %	100,00 %
Attitudinal	26	28	54
	48,15 %	51,85 %	100,00 %

Table 3 presents a descriptive analysis of the variable "Usage of Information Technologies," highlighting the distribution of respondents across different levels within each dimension. In the "Technological" dimension, a majority of teachers (72,22 %) are categorized as having a "Medium" level of technological usage, while 27,78 % fall into the "Low" category. The "Pedagogical" and "Management" dimensions show an even distribution, with 50 % of teachers falling into both the "Low" and "Medium" categories. In the "Social, Ethical, and Legal" dimension, 53,70 % of teachers exhibit a "Medium" level, while 46,30 % are categorized as "Low." Lastly, in the "Attitudinal" dimension, 51,85 % of teachers are classified as having a "Medium" level, while 48,15 % fall into the "Low" category. These results provide insights into the varying levels of technology usage among teachers across different dimensions, highlighting areas where improvement or support may be needed.

Table 4. Level of the variable "Use of ICT"

	Frequency	Percentage	Valid Percentage	Accumulated Percentage
Low	22	40,74	40,74	40,74
Medium	32	59,26	59,26	100,00
Total	54	100,00	100,00	

Table 4 presents the level of the variable "Use of ICT." It shows that out of the total sample of 54 participants, 22 of them, accounting for 40,74 % of the sample, have a low level of ICT usage. On the other hand, 32 participants, representing 59,26 % of the sample, have a medium level of ICT usage. The valid percentages consider the cases with non-missing data for this variable, and the accumulated percentage shows the distribution of participants across the two levels, indicating that 40,74 % have a low level, and 100 % are accounted for when considering

both low and medium levels of ICT usage.

Descriptive Analysis of the Digital Competencies Variable

Table 5. Level of Dimensions of the Digital Competencies Variable

	Low	Medium	Total
Information and Information Literacy	54	0	54
	100,00 %	0,00 %	100,00 %
Communication and Collaboration	52	2	54
	96,30 %	3,70 %	100,00 %
Digital Content Creation	53	1	54
	98,15 %	1,85 %	100,00 %
Security	54	0	54
	100,00 %	0,00 %	100,00 %
Problem Solving	49	5	54
	90,74 %	9,26 %	100,00 %

Table 5 provides an overview of the levels within the dimensions of the Digital Competencies Variable. In the dimension of "Information and Information Literacy," all participants (100 %) fall into the "Low" category, indicating a lower level of competency in this area. Similarly, in the "Security" dimension, all participants (100 %) also belong to the "Low" category, suggesting a need for improvement in digital security skills. In contrast, the dimension of "Communication and Collaboration" shows that the majority of participants (96,30 %) are in the "Low" category, with a small percentage (3,70 %) in the "Medium" category. The "Digital Content Creation" dimension has a similar distribution, with the majority (98,15 %) in the "Low" category and a minority (1,85 %) in the "Medium" category. Lastly, the dimension of "Problem Solving" indicates that a significant portion (90,74 %) of participants are in the "Low" category, while a smaller but notable percentage (9,26 %) are in the "Medium" category. Overall, these results highlight areas where participants may need further development in their digital competencies, particularly in information literacy, security, communication, and content creation.

Table 6. Level of the Digital Competencies Variable

	Frequency	Percentage	Valid Percentage	Accumulated Percentage
Bajo	54	100,00	100,00	100,00
Total	54	100,00	100,00	

In general, the variable of Digital Competencies among primary and secondary school teachers at I.E. 50499 Justo Barrionuevo Álvarez in the city of Cusco shows a low level, represented by 100,00 %. This is likely due to the fact that the majority of teachers are over 30 years old, as other research suggests that teachers under the age of 30 have a greater inclination towards the curricular integration of ICT in their classroom sessions.

Inferential Analysis

Determination of the Type of Distribution

Table 7. Normality Test for the "Usage of Information Technologies" Variable

	Kolmogorov-Smirnov		
	Estadístico	gl	Sig.
Usage of Information Technologies	,085	54	,200*
Technological	,149	54	,004
Pedagogical	,207	54	,000
Management	,173	54	,000
Social, Ethical, and Legal	,158	54	,002
Attitudinal	,288	54	,000

Table 7 presents the results of the normality test for the "Usage of Information Technologies" variable using the Kolmogorov-Smirnov and Shapiro-Wilk tests. The analysis indicates that the overall "Usage of Information

Technologies" variable follows a normal distribution, as the significance level (Sig.) for this variable is greater than 0,05. However, it's important to note that specific dimensions within this variable, such as "Technological," "Pedagogical," "Management," "Social, Ethical, and Legal," and "Attitudinal," do not exhibit normal distribution patterns, as their significance levels are less than 0,05. This suggests that these dimensions may have non-normal distributions in the data.

Table 8. Normality Test for the Digital Competencies variable and dimensions

	Kolmogorov-Smirnov		
	Estadístico	**gl**	**Sig.**
Digital Competence	,151	54	,000
Information and Information Literacy	,200	54	,000
Communication and Collaboration	,142	54	,008
Digital Content Creation	,286	54	,000
Security	,238	54	,000
Problem Solving	,180	54	,000

The table titled "Normality Test for the Digital Competencies variable" presents the results of a Kolmogorov-Smirnov test, which is a statistical test used to determine if a sample comes from a normally distributed population. In the context of digital competencies, the variable and dimensions were tested: Digital Competence, Information and Information Literacy, Communication and Collaboration, Digital Content Creation, Security, and Problem Solving. For each of these variables, two statistics are reported: the Kolmogorov-Smirnov statistic (a number that indicates the extent of deviation from a normal distribution) and the significance level (Sig.). The sample size for each test was 54. The results show that none of the variables follow a normal distribution since all have a significance level of less than 0,05. Specifically, Digital Competence had a statistic of 0,151, Information and Information Literacy had 0,200, Communication and Collaboration had 0,142, Digital Content Creation had 0,286, Security had 0,238, and Problem Solving had 0,180. The low significance values (all at or below 0,008) strongly suggest that the distribution of scores in each of these digital competence areas significantly deviates from a normal distribution.

Statistical results

Table 9. Relationship between the Use of ICTs and Digital Competences

			Use of Information Technologies	**Digital Competence**
Spearman's Rho	**Use of Information Technologies**	Correlation Coefficient	1,000	,877**
		Sig. (two-tailed)		,000
		N	54	54
	Digital Competence	Correlation Coefficient	,877**	1,000
		Sig. (two-tailed)	,000	
		N	54	54

The statistical results presented in table 9 explore the relationship between the use of Information and Communication Technologies (ICTs) and digital competence. The table outlines the findings of a Spearman's rho correlation analysis, a non-parametric measure used to ascertain the strength and direction of association between two variables. The analysis reveals a strong positive correlation between the use of ICTs and digital competence, as indicated by a correlation coefficient (rho) of 0,877, which is statistically significant with a bilateral significance level of 0,000. This high correlation coefficient suggests a strong relationship, implying that as the use of ICTs increases, so does the level of digital competence. The sample size for this analysis is 54 for both variables. The strength of this correlation underscores the integral role of ICT usage in enhancing digital competencies, highlighting the interconnectedness of these two aspects in the modern digital landscape.

Checking the Relationship Between Variables and Dimensions

Table 10 showcases the statistical relationship between the use of Information Technologies and various dimensions of Digital Competences. This relationship is analyzed through correlation coefficients. A significant positive correlation is observed in all dimensions. Specifically, Information and Information Literacy has a correlation coefficient of 0,633, Communication and Collaboration has 0,766, Digital Content Creation has 0,763, Security has 0,743, and Problem Solving has a lower yet significant correlation of 0,457. All these correlations

are statistically significant with a two-tailed significance level of 0,000, except for Problem Solving, which has a significance level of 0,001. The sample size for each correlation is 54. These results suggest a strong association between the use of Information Technologies and the proficiency in various digital competences, with the strongest correlations seen in Communication and Collaboration, Digital Content Creation, and Security. The positive correlations imply that increased usage of information technologies is likely associated with higher levels of digital competencies across these dimensions.

Table 10. Relationship between the Use of Information Technologies and the Dimensions of the Digital Competences Variable

		Use of Information Technologies
Information and Information Literacy	Correlation Coefficient	,633**
	Sig. (two-tailed)	,000
	N	54
Communication and Collaboration	Correlation Coefficient	,766**
	Sig. (two-tailed)	,000
	N	54
Digital Content Creation	Correlation Coefficient	,763**
	Sig. (two-tailed)	,000
	N	54
Security	Correlation Coefficient	,743**
	Sig. (two-tailed)	,000
	N	54
Problem Solving	Correlation Coefficient	,457**
	Sig. (two-tailed)	,001
	N	54

Table 11. Relationship between Digital Competences and the Dimensions of the Use of Information Technologies Variable

		Digital Competence
Technological	Correlation Coefficient	,603**
	Sig. (two-tailed)	,000
	N	54
Pedagogical	Correlation Coefficient	,529**
	Sig. (two-tailed)	,000
	N	54
Management	Correlation Coefficient	,689**
	Sig. (two-tailed)	,000
	N	54
Social, Ethical, and Legal	Correlation Coefficient	,425**
	Sig. (two-tailed)	,001
	N	54
Attitudinal	Correlation Coefficient	,675**
	Sig. (two-tailed)	,000
	N	54

Table 11 presents the statistical relationship between digital competence and the dimensions of the use of Information Technologies. The correlations between digital competence and each dimension are quantified using Spearman's correlation coefficients. The results show significant positive correlations across all dimensions. For the Technological dimension, there is a correlation coefficient of 0,603, indicating a strong association with digital competence. The Pedagogical dimension shows a slightly lower but still significant correlation of 0,529. The Management dimension exhibits a higher correlation of 0,689, suggesting a particularly strong link with digital competence. The Social, Ethical, and Legal dimension has a correlation coefficient of 0,425, which is the lowest among the dimensions but still indicates a significant positive relationship. Lastly, the Attitudinal

dimension has a correlation coefficient of 0,675, demonstrating a strong association with digital competence. All these correlations are statistically significant with a two-tailed significance level of 0,000 for all dimensions except the Social, Ethical, and Legal dimension, which has a significance level of 0,001. The sample size for each correlation is 54. These findings highlight the interconnected nature of digital competence with various aspects of information technology use, emphasizing the importance of a comprehensive approach in developing digital competencies.

DISCUSSION

Integration and Impact of ICT in Education

The study's findings resonate with the global trend of integrating ICT in education, a critical aspect highlighted by authors such as [1] and [2]. This trend has seen a rapid acceleration due to the COVID-19 pandemic, forcing both educators and students to adapt swiftly to new technologies for educational purposes. However, the study reveals a gap between this global movement and the local implementation in Cusco. Despite Cusco's progress in equipping schools with ICT infrastructure,[9] there is an apparent discrepancy in teachers' digital competencies. This contrast is significant because it highlights the need for more targeted efforts in ICT training for teachers, as indicated by [4] and [7], to match the infrastructural advancements.

Teachers' Proficiency in ICT and Digital Competencies

The results highlight a critical concern regarding teachers' proficiency in ICT and digital competencies. While the infrastructure may be in place, as reported by ENEDU,[9] the actual usage and mastery of these technologies by teachers remain low. This situation is reflected in the findings of Blink Learning [4] and [38], which indicate a lack of consistent ICT usage and training among teachers. This gap is crucial in the context of Peru, where national strategies for ICT competencies in education have not been a priority.[7] This lack of proficiency undermines the potential benefits of ICT in enhancing educational quality and suggests a need for more substantial institutional support and training programs.

Regional Vs. National and International Trends

Comparatively, the situation in Cusco, with its higher-than-average ICT infrastructure, stands in contrast to the broader national and international challenges in ICT integration in education. Authors like [21] and [22] emphasize the multifaceted nature of ICT and its potential in education. However, the local scenario in Cusco, as evidenced by the study, suggests that having infrastructure alone does not automatically translate into effective ICT usage. This discrepancy underscores the need for policies and strategies that not only focus on providing hardware but also on developing digital literacy and competencies, as advocated by UNESCO[27] and Ludeña[28].

Future Directions and Policy Implications

Finally, the study's findings call for a reevaluation of current educational policies and strategies concerning ICT. There is a clear need for policies that go beyond infrastructure development to include comprehensive training and support for teachers, as suggested by [25] and [26]. The role of e-skills in digital education, as discussed by [30], becomes particularly relevant in this context. Developing these competencies among teachers is not just about keeping up with technological advancements; it's about reshaping the educational landscape to better prepare students for a digital world. This requires a concerted effort from educational authorities, policymakers, and institutions to prioritize digital literacy and competency training for teachers, aligning with the global shift towards a knowledge-based society.

Incorporating the perspectives and findings of authors mentioned in your article, this discussion contextualizes your study within the broader national and international discourse on ICT in education, highlighting the unique challenges and opportunities in the Cusco region.

CONCLUSIONS

First: There is a significant relationship between the use of information technologies and digital competences among students of the Institución Educativa 50499 Justo Barrionuevo Álvarez in Oropesa - Cusco during 2023. This relationship is quantitatively strong, as evidenced by a correlation coefficient of 0,877, indicating a high positive correlation. Furthermore, the p-value of 0,000 underscores the statistical significance of this correlation, suggesting that the observed association is not a matter of chance but reflects a real and consistent link. This implies that students who more intensively use information technologies tend to develop stronger digital competencies.

Second: The level of use of information technologies among teachers at the same institution is reported to be medium for 59,3 % and low for 40,7 %. This finding is crucial as it indicates that a significant majority of the teachers have a medium level of usage of these technologies. However, a considerable percentage exhibit low

usage, which might indicate an area for improvement and increased integration of information technologies in their professional practice.

Third: The level of digital competences among teachers at Institución Educativa 50499 Justo Barrionuevo Álvarez in Oropesa - Cusco is reported to be low for 100 % of the participants. This is a critical finding, highlighting a substantial gap in digital competencies among the teachers. It suggests an urgent need for targeted professional development programs focusing on enhancing digital skills and competencies. This is particularly important in the current digital age, where such competencies are increasingly vital for effective teaching and learning.

As a conclusion, while there is a positive correlation between the use of information technologies and digital competencies among students, there is a concerning gap in both the use of these technologies and the digital competencies among teachers. These findings point towards the need for interventions at the teacher level, including training and resources to boost their digital proficiency, which in turn could positively impact their teaching methodologies and student learning outcomes.

REFERENCES

1. Alcívar, C., Vargas, V., Calderón, J., Triviño, C., Santillan, S., Soria, R., & Cardenas, L. (2019). El uso de las TIC en el proceso de enseñanza-aprendizaje de los docentes en las Universidades del Ecuador. Revista Espacios, 40(2). https://www.revistaespacios.com/a19v40n02/a19v40n02p27.pdf

2. Cardozo, M. (2022). Uso de las TIC en el proceso de enseñanza- aprendizaje en estudiantes del primer y segundo ciclo de la educación escolar básica. Ciencia Latina Revista Científica Multidisciplinar, 6(6), 8354-8371. https://doi.org/10.37811/cl_rcm.v6i6.4002

3. Blink Learning. (2018b). IV Estudio sobre el uso de la tecnología en la educación: informe de resultados Perú. Madrid: Blink Learning.

4. Blink Learning. (2018a). IV Estudio sobre el uso de la tecnología en la educación. Madrid: Blink Learning. https://www.realinfluencers.es/2018/11/13/iv-estudio-sobre-el-uso-de-la-tecnologia-en-la-educacion/

5. de la Portilla Díaz, J. M. (2023). La estrategia educativa 'Aprendo en casa' y la implementación del enfoque intercultural. Investigaciones Sociales, 1(48), 173–190. https://doi.org/10.15381/is.n48.24135

6. Cáceres León, K., & Hidalgo Lovo, D. I. G. (2023). Experiencia Subjetiva del docente rural de Loreto frente al programa "Aprendo en Casa" en pandemia. Revista Peruana De Investigación Educativa, 15(18). https://doi.org/10.34236/rpie.v15i18.422

7. Mamani, R. (2022). Competencias TIC y compromiso docente en la I.E. Manuel Flores Calvo - Tacna, 2021. Tesis de maestría, Universidad Nacional Jorge Basadre Grohmann, Tacna. http://repositorio.unjbg.edu.pe/bitstream/handle/UNJBG/4826/427_2023_mamani_callo_rj_espg_maestria_en_tecnologia_educativa.pdf

8. Villalta Jadan, B. E., Machuca Vivar, S. A., & Palma Rivera, D. P. (2023). Explorando la brecha digital en el acceso tecnológico y su influencia en la educación: abordando las diferencias entre comunidades. Dilemas contemporáneos: Educación, Política y Valores. https://doi.org/10.46377/dilemas.v11iespecial.3889

9. ENEDU. (2019). Resultados de la Encuesta Nacional a Instituciones Educativas. Lima: Instituto Nacional de Estadística e Informática.

10. Mosquera, C. G. O., Llanos, X. M. G., Gamarra, O. V. M. H., & Macías, M. D. C. G. (2023). Percepciones del uso de las TIC en Docentes y Estudiantes Universitarios pospandemia. Journal of Science and Research: Revista Ciencia e Investigación, 8(3), 24-42. https://dialnet.unirioja.es/servlet/articulo?codigo=9048621

11. Pasato, A. R. L. (2023). Competencias docentes tic para la formación de las ciencias sociales de los estudiantes del bachillerato. Revista Oratores, (19), 203-216. https://revistas.umecit.edu.pa/index.php/oratores/article/view/1185

12. Vera, J. P. D., Sarmiento, J. F., Castro, M. E. S., Delgado, J. C. V., & Muñoz, G. F. R. (2023). Adaptación y desafíos: Análisis de la labor de los docentes con el uso de las TIC antes y durante la pandemia. Domino de las Ciencias, 9(3), 1574-1601.

13. Cárdenas Cordero, N. M., Guevara Vizcaíno, C. F., Moscoso Bernal, S. A., & Álvarez Lozano, M. I. (2023). Metodologías activas y las TIC en los entornos de aprendizaje. Conrado, 19(91), 397-405. http://scielo.sld.cu/scielo.php?pid=S1990-86442023000200397&script=sci_arttext&tlng=en

14. Ruiz-Morales, Y. A., & Caicedo-Villamizar, S. B. (2022). e-Evaluación del trabajo colaborativo en estudiantes universitarios. Saber, Ciencia y Libertad, 17(1), 364-377. https://revistas.unilibre.edu.co/index.php/saber/article/view/8473

15. El Peruano. (17 de Mayo de 2020). Una profesora que domina las TIC en el aula. https://elperuano.pe/noticia/95986-una-profesora-que-domina-las-tic-en-el-aula

16. Awofala, A., & Oladipo, A. (2023). A simulation study of preservice STM teachers' technostress as related to supposed utility, attitudes towards portable technolo-gy and continuance intents to use portable technology. Digital Education Review, (44). https://revistes.ub.edu/index.php/der/article/view/41056

17. Khlaif, Z. N., Sanmugam, M., & Ayyoub, A. (2023). Impact of technostress on continuance intentions to use mobile technology. The Asia-Pacific Education Researcher, 32(2), 151-162. https://link.springer.com/article/10.1007/s40299-021-00638-x

18. Sun, G. H., & Hoelscher, S. H. (2023). The ChatGPT storm and what faculty can do. Nurse Educator, 48(3), 119-124. https://journals.lww.com/nurseeducatoronline/abstract/2023/05000/the_chatgpt_storm_and_what_faculty_can_do.1.aspx?context=featuredarticles&collectionid=5

19. Marnita, M., Nurdin, D., & Prihatin, E. (2023). The Effectiveness of Elementary Teacher Digital Literacy Competence on Teacher Learning Management. Journal of Innovation in Educational and Cultural Research, 4(1), 35-43. http://www.jiecr.org/index.php/jiecr/article/view/444

20. Hernández, R., Orrego, R., & Quiñones, S. (2018). Nuevas formas de aprender: La formación docente frente al uso de las TIC. Propósitos y Representaciones, 2(18), 671-701. http://dx.doi.org/10.20511/pyr2018.v6n2.248

21. Jaramillo, S., Tacuri, L., Hurtado, C., & Muñoz, C. (2019). El uso de las TICS en colegios públicos de la ciudad de Loja. INNOVA Research Journal, 72-88. https://doi.org/10.33890/innova.v4.n3.1.2019.1042

22. Cruz, M., Pozo, M., Aushay, H., & Arias, A. (2019). Las tecnologías de la información y de la comunicación como forma investigativa interdisciplinaria con un enfoque intercultural para el proceso de formación estudiantil. E-Ciencias de la Información, 9(1). doi:https://doi.org/10.15517/eci.v1i1.33052

23. Cárdenas, M., Díaz, E., Plúa, K., & Solís, M. (2019). Las TIC en la educación superior, paradigma contemporáneo. Ecuador: ColloQUIUM.

24. Bolaji, H. O., & Onikoyi, O. A. (2024). Usability of ICT for class size remediation and learning among secondary schools. Indonesian Journal of Educational Research and Technology, 4(1), 23-28. https://ejournal.upi.edu/index.php/IJERT/article/view/51945/20609

25. Levano, L., Sanchez, S., Guillén, P., Tello, S., Herrera, N., & Collantes, Z. (2019). Competencias digitales y educación. Propósitosy Representaciones, 7(2), 569-588. http://dx.doi.org/10.20511/pyr2019.v7n2.329

26. Díaz, D., & Loyola, E. (2021). Competencias digitales en el contexto COVID 19: una mirada desde la educación. Revista Innova Educación, 3(1). https://doi.org/10.35622/j.rie.2021.01.006

27. UNESCO. (2018). Competencias para un mundo conectado. Madrid: Educación 2030.

28. Ludeña, J. (2021). Competencias digitales. https://economipedia.com/definiciones/competencias-digitales.html

29. Reddy, K. S., & Babu, N. S. (2024). Navigating the digital divide: assessing faculty ICT skills and challenges in shaping the future of higher education in India. Brazilian Journal of Development, 10(1), 355-378. https://ojs.brazilianjournals.com.br/ojs/index.php/BRJD/article/view/66110

30. Basantes-Andrade, A., Cabezas, M., & Casillas, S. (2020). Competencias digitales en la formación de tutores virtuales en la Universidad Técnica del Norte, Ibarra-Ecuador. Formación universitaria, 13(5). http://dx.doi.org/10.4067/S0718-50062020000500269

31. Liando, N. V. F., Tatipang, D. P., & Wuntu, C. N. (2023). TPACK Framework Towards 21st Century's Pre-Service English Teachers: Opportunities and Challenges in Application. Edumaspul: Jurnal Pendidikan, 7(1), 1799-1815. https://ummaspul.e-journal.id/maspuljr/article/view/6479

32. Rahmi, P. W. L., Aisyah, D., & Amrina, A. (2023). The Use Of ICT By Teachers In Implementing A Competency-Based Curriculum At Elementary School. Lingeduca: Journal of Language and Education Studies, 1(2), 18-34. https://journal.ypidathu.or.id/index.php/lingeduca/article/view/64

33. Wang, Q., & Zhao, G. (2023). Exploring the influence of technostress creators on in-service teachers' attitudes toward ICT and ICT adoption intentions. British Journal of Educational Technology, 54(6). 1771-1789. https://bera-journals.onlinelibrary.wiley.com/doi/abs/10.1111/bjet.13315

34. Arnado, A. A., & Aviles, G. M. (2023). ICT Integration in IPEd Schools: Challenges and Skills of Intermediate Teachers and Learners. International Journal of Membrane Science and Technology, 10(2), 482-510. https://www.cosmosscholars.com/phms/index.php/ijmst/article/view/1260

35. Hernández, R. (2018). Metodología de la Investigación. México D.F.: McGraw Hill.

36. Carrasco, S. (2019). Metodología de la investigación científica (Decimo novena ed.). Lima: San Marcos E I R.

37. Gómez, M. (2020). Metodología y técnica de la investigación. México D.F.: Universidad Autónoma del Estado de México.

38. INEI. (2019). Principales resultados de la Encuesta Nacional a Instituciones Educativas de nivel inicial, primaria y secundaria, 2018. Lima: Instituto Nacional de Estadística e Informática.

39. Çelik, B. N., & Gökbulut, B. (2023). The Relationship Between Teachers' Technostress Perceptions and Their Teaching Motivation and Happiness Levels. İnönü Üniversitesi Eğitim Fakültesi Dergisi, 24(2), 745-770. https://dergipark.org.tr/en/pub/inuefd/issue/79814/1223908

FUNDING

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

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

Conceptualization: Jhonny Richard Rodriguez-Barboza.

Research: Lida Vásquez-Pajuelo.

Methodology: Karina Raquel Bartra-Rivero.

Original drafting-drafting: Edgar Antonio Quintanilla-Alarcón, Wilfredo Vega-Jaime, Raquel Elisa Rosas-Rivero.

Writing-revision and editing: Dr. Jhonny Richard Rodriguez-Barboza y Lida Vásquez-Pajuelo.