Technological competencies and the academic performance of university students

Competencias tecnológicas y el desempeño académico de los estudiantes universitarios

Savier Fernando Acosta Faneite*
https://orcid.org/0000-0003-2719-9163
Maracaibo, Zulia state / Venezuela

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* Ph.D. in Educational Sciences and Postdoctoral Degree in Management for Higher Education. Biology Teacher, Universitdad del Zulia, Maracaibo - Venezuela. Email: savier.acosta@gmail.com

Abstract

The objective of the study was to establish the relationship between digital competencies and university teacher performance. The methodology was based on the positivist paradigm with a quantitative approach. The research was basic, descriptive and correlational. The non-experimental and cross-sectional design included a sample of 87 students from a public university in Maracaibo, Venezuela selected by convenience. The survey was used as the data collection technique, applying a questionnaire whose reliability was high (Cronbach's alpha = 0.975). The data were processed using SPSS software. The results indicated a moderate positive correlation (Spearman = 0.356) between the variables, suggesting that, as teachers' digital skills increase, their performance improves. In conclusion, the development of teachers' digital skills contributes to improving educational quality in the university context.

Keywords: Competencies, digital competencies, teaching performance, university professor.

Resumen

El estudio tuvo como objetivo establecer la relación entre las competencias digitales y el desempeño del docente universitario. La metodología se fundamentó en el paradigma positivista con un enfoque cuantitativo. La investigación fue de tipo básica, descriptiva y correlacional. El diseño no experimental y transversal incluyó una muestra de 87 estudiantes de una universidad pública en Maracaibo, Venezuela seleccionados por conveniencia. Se utilizó la encuesta como técnica de recolección de datos, aplicándose un cuestionario cuya confiabilidad fue alta (Alfa de Cronbach = 0,975). Los datos se procesaron mediante el software SPSS. Los resultados indicaron una correlación positiva moderada (Spearman = 0,356) entre las variables, sugiriendo que, a medida que aumentan las competencias digitales de los docentes, su desempeño mejora. En conclusión, el desarrollo de las habilidades digitales de los profesores contribuye a mejorar la calidad educativa en el contexto universitario.

Palabras clave: competencias, competencias digitales, desempeño docente, docente universitario.

Introduction

In the current context of the educational process, the use of technology has become essential, as it facilitates students' acquisition of knowledge. Acosta & Fuenmayor (2022) highlight that Information and Communication Technologies (ICTs) have profoundly revolutionized how university educators seek and manage the content needed for their teaching. These technological advancements not only improve access to information but also foster greater interactivity and collaboration in the educational realm, thereby enhancing the quality of both learning and teaching.

Therefore, higher education teachers must possess digital competencies. According to Centeno (2021), these competencies are defined as a set of knowledge, skills, and abilities associated with the use of technologies in educational environments, facilitating the achievement of curri-

cular goals and competencies. In this regard, Sánchez *et al.* (2022) emphasize that digital competencies include aspects related to hardware, software, school organization and management, the use of ICTs, and the social, ethical, and legal elements associated with their use.

Meanwhile, Cateriano *et al.* (2021) point out that, globally, many teachers face difficulties in searching for relevant data and information. As a result, many educators rely solely on Google as their main search tool and are unfamiliar with the use of databases, institutional repositories, and advanced searches with Boolean operators to access quality information. This lack of skills limits their ability to access appropriate academic resources and reduces the quality of information used in their teaching practice.

In this context, Cobos *et al.* (2020) indicate that there are global gaps in the use of technology for academic purposes and the dissemination of information. This is because many educators lack knowledge on how to select appropriate resources and effectively use search engines to choose topics aligned with students' research needs and academic levels.

Similarly, Díaz & Serra (2020) suggest that it is difficult to determine to what extent teachers misuse the Internet when searching for information. This may be due to a lack of necessary skills to fully utilize technologies in teaching or awareness of the variety of search engines available for consulting scientific information. Consequently, many teachers resort exclusively to traditional methods for finding quality scientific information, which impacts their classes and may negatively affect students' educational progress.

For this reason, Espinoza (2020) highlights the importance of educators knowing and using academic search engines such as Google Scholar and Microsoft Academic, which provide access to peer-reviewed articles and books. Scientific journals on platforms like PubMed, IEEE Xplore, and JSTOR, as well as databases like Scopus, SciELO, Dialnet, and Redalyc, offer specialized and high-quality research. In addition, academic networks such as ResearchGate and Academia.edu facilitate collaboration and access to publications and scientific websites offering high-quality reports and studies.

In this context, Baldomero (2022) emphasizes that the digital competencies of higher education teachers include information literacy, essential for navigating, filtering, and managing digital information. He also highlights the importance of online communication and collaboration, involving interaction and proper use of netiquette. Another key competency is digital content creation, which requires integrating platforms and respecting copyright. Additionally, Díaz & Loyola (2021) note that these digital competencies include data search and management, person-to-person interaction, and data protection. They also highlight the importance of technological skills that enable teachers to search for and filter relevant information while applying effective strategies for virtual teaching.

On the other hand, Flores & Garrido (2019) underline that in Latin America, teachers must develop digital, communicative, intellectual, and ethical skills to ensure student learning. Likewise,

Mancha *et al.* (2022) argue that the new educational environment presents the challenge of acquiring knowledge about the use of technologies, which are fundamental tools for consulting, producing, and distributing educational content.

In this regard, Pérez (2017) asserts that to use ICTs correctly and effectively, it is necessary to improve teachers' digital skills. Therefore, in the educational environment, it is crucial to create an appropriate connection between the use of ICTs, pedagogy, and strategies that integrate education and technology.

Zabalza & Zabalza (2020) describe that education based on the digital competence approach is a recent concept that significantly differs from traditional teaching in terms of concepts, methods, and practices. Its purpose is to promote the acquisition of skills that enable individuals to succeed in various contexts, including economic, labor, social, and academic.

In this respect, Acosta & Barreto (2023) note that education aims to respond to the new knowledge and information society; therefore, teachers need to acquire digital skills that allow them to learn how to use technological tools properly. In this sense, Sánchez & Carrasco (2021) argue that additional training on using technology in the classroom is necessary to foster a critical attitude toward creating, using, and legally managing content. Hence, teachers should learn to use these resources to be more creative and apply them in various areas of learning.

Moreover, Puche & Acosta (2024) state that in Venezuela, mechanisms must be implemented to transform and develop education, technology, and science, promoting the development of life skills. They also emphasize that schools must respond to societal needs, meaning the educational process should be approached from a holistic perspective. This involves managing each academic process to facilitate students' effective learning.

In this context, Díaz & Castillo (2017) highlight that excellent and effective teaching management will develop students' cognitive, affective, and psychomotor skills, rather than merely imparting information. Similarly, Acosta & Barrios (2023) indicate that teachers should stimulate learning, contextualize content, and integrate students into instructional design.

Furthermore, Rojas & Arévalo (2022) note that teacher performance is closely linked to the quality of education. Therefore, teachers must plan and formulate a professional activity plan that aligns with the context, educational process, and evaluation indicators. It is also crucial to consider both external and internal educational factors and integrate technological practices to improve teaching quality.

Additionally, Oviedo & Páez (2020) emphasize that teacher performance is linked to digital, cognitive, and affective competencies, directly impacting educational quality. Soria *et al.* (2020) affirm that optimal teacher performance is evident when educators have a strong command of content, employ effective pedagogical mediation, and use instructional and evaluative resources tailored to students' needs.

In this context, Arenas *et al.* (2021) argue that for effective teaching performance, educators must possess digital competencies, which enable them to stimulate learning, contextualize content, and integrate students into the educational process. Cabero & Martínez (2019) highlight that the Internet provides informational resources and a fast communication platform between teachers and students. Furthermore, Acosta (2022) emphasizes that integrating the Internet, multimedia technologies, and gamification is key in virtual teaching, noting the growing support among teachers for online collaboration, multimedia use, and diversified assessment methods.

On the other hand, Carretero (2021) argues that there is a gap between knowing and doing. However, various studies and scientific literature have demonstrated that an appropriate instructional design incorporating technologies offers several pedagogical benefits for more effective teaching. In this regard, García *et al.* (2021) emphasize that the use of technologies such as Virtual Learning Environments (VLE) in higher education presents multiple advantages. Among these are the ability to reach a larger number of users, as well as providing flexibility in scheduling, monitoring, and tracking students' learning progress.

Given the above, it can be stated that digital competencies are closely related to teacher performance. Educators must plan and organize their strategies according to educational objectives, manage available resources, adjust time and school environments, and enhance learning with the support of technology. This contributes to the development of competencies established in the curriculum design, optimizing the educational process, and promoting more effective learning tailored to current needs.

In this sense, it has been observed that some university professors in Maracaibo, Zulia, Venezuela, exhibit weaknesses in using technological tools, predominantly opting for traditional teaching methods. Despite technological advancements and current market demands, these teachers tend to repeat familiar methods and focus on student memorization. This situation may be attributed to a lack of digital competencies, as well as limited access to the internet, digital platforms, and technological equipment—tools essential for significantly improving teaching and learning.

Another relevant aspect is age, as many of these educators are over 50 years old and have not been technologically literate. Most possess only basic digital skills and need improvement in searching for information on specialized platforms, using virtual libraries, and managing quality academic information. This lack of digital skills negatively impacts teachers' performance, affecting their ability to plan and assess their practices, which could, in turn, influence students' academic performance. Based on the issues described above, the objective of the study was to establish the relationship between digital competencies and university teacher performance.

Methodology

The study was based on the positivist paradigm and employed a quantitative approach, as the primary goal was to measure and analyze the relationship between digital competencies and

teaching performance in a university context. According to Hernández & Mendoza (2018), this approach allows for the collection and analysis of numerical data, providing a solid foundation for the objective interpretation of results.

This was a basic research study, aimed at generating theoretical knowledge and a deeper understanding of the phenomenon under investigation, without the immediate intention of applying this knowledge in a practical context. The descriptive level, as Arias (2016) explains, offers a clear and comprehensible view of the variables involved. The study focused on a detailed characterization of university teachers' digital competencies and their performance, allowing for a deeper understanding of professors' digital skills and how these influence their academic performance.

The scope of the study was correlational, enabling an examination of the relationship and degree of association between teachers' digital competencies and their performance. As noted by Hernández & Mendoza (2018), this type of study is essential for identifying patterns and connections between variables without necessarily establishing direct causality.

The study design was field-based, as it was conducted in the location where the problem occurred. Additionally, it was classified as non-experimental because independent variables were not manipulated but observed as they naturally occurred in their environment. The cross-sectional nature of the design meant that data was collected at a single point in time, offering a snapshot of the state of digital competencies and teaching performance at a specific moment.

The sample consisted of 87 university students from a public university in Maracaibo, Zulia, Venezuela. These students were selected through non-probabilistic convenience sampling. This sampling method was chosen for its ease of access to participants and the feasibility of the study given the time and resource constraints. Although non-probabilistic, this approach provided relevant and valuable information about the topic under investigation.

It is important to note that no specific university was mentioned in the study to ensure the generalization and validity of the results. By not specifying the institution, biases related to specific university characteristics were avoided, allowing the findings to be applicable to other similar institutions. This approach minimized confidentiality risks and focused the study on the main subject rather than institutional details, facilitating comparison with other studies and contributing to a broader, more generalizable knowledge base.

Inclusion criteria required that participants be university students currently enrolled in higher education programs at the selected institution, with at least a basic level of digital competencies. Informed consent was provided to students, detailing the purpose of the study and their rights, including confidentiality and the option to withdraw if they did not wish to complete the survey.

First-year students were excluded due to their lack of relevant experience with teaching performance and digital competencies. Additionally, those unable to provide full informed consent

or with limited exposure to digital competencies were excluded to maintain the validity of the study's results.

For data collection, the survey technique was used, and the instrument was a structured digital questionnaire containing specific information on the relevant variables, dimensions, and indicators for the study. This enabled a systematic and organized collection of data. The reliability of the questionnaire was confirmed through Cronbach's Alpha coefficient, which yielded a value of 0.975, indicating high reliability and internal consistency of the instrument used.

The collected data were processed using SPSS version 27, a robust statistical tool that facilitated a detailed analysis of the relationships between digital competencies and teaching performance. This software allowed for both descriptive and inferential analyses, providing a solid foundation for the study's conclusions.

Results

After processing the data, descriptive analyses were conducted to provide an overview of the variables. Subsequently, inferential analysis methods were applied to evaluate the correlation between digital competencies and university teaching performance. This approach allowed for a detailed examination of the relationship between the two variables and how they interrelate. Below are the tables with the results, which clearly illustrate the connection between teachers' digital competencies and their performance in the university context, offering a comprehensive view of the findings.

Table 1
Digital Competencies

Levels	Search and management		Information literacy		Communication and development		Digital content creation	
	F	%	F	%	F	%	F	%
Deficient	13	14,9	15	17,2	30	34,5	16	18,4
Moderate	74	85,1	72	82,8	53	60,9	61	70,1
Efficient	0	0	0	0	4	4,6	10	11,5
Total	87	100	87	100	87	100	87	100

Note: Own elaboration (2024).

Table 1 presents the results for the variable "digital competencies" along with each of its dimensions. It is observed that 85.1% of the respondents consider that professors' "search and management" of information is at a moderate level, while 14.9% express that it is deficient. Regarding the "information literacy" dimension, 82.8% of the participants believe that teachers have a moderate level, while 17.2% indicate it is deficient.

For the "communication and development" dimension, 60.9% of respondents think that professors are at a moderate level, while 34.5% believe it is deficient. Finally, in the "digital content creation" dimension, 70.1% of respondents state that professors are at a moderate level, with 18.4% considering them deficient.

Table 2
University Professors' Performance

Niveles	Content mastery		Pedagogical mediation		Use of instructional resources		Contextualized evaluation	
	F	%	F	%	F	%	F	%
Deficient	17	19,3	11	12,5	12	14,8	17	19,3
Moderate	44	50	45	52,3	41	46,6	51	58
Efficient	26	30,7	31	35,2	34	38,6	19	22,7
Total	87	100	87	100	87	100	87	100

Note: Own elaboration (2024).

Table 2 displays the results for the variable "teaching performance" with its dimensions. It is observed that 50% of the respondents consider that teachers' "content mastery" is at a moderate level, 30.7% deem it efficient, and 19.3% rate it as deficient. Regarding the "pedagogical mediation" dimension, 52.3% view it as moderate, 35.2% consider it efficient, and 12.5% rate it as deficient.

For the "use of instructional resources" dimension, 46.6% of respondents place it at a moderate level, and 38.6% find it efficient; however, 14.8% categorize it as deficient. Finally, in the "contextualized evaluation" dimension, 58% of respondents indicate that professors are at a moderate level, 22.7% consider it efficient, and 19.3% rate it as deficient.

Table 3
Correlation between digital competencies and university professors' performance.

			Digital competency	Teaching performance
Spearman's Rho	Digital competency	Correlation coefficient	1	0,356**
		Significance (Two-tailed)	-	0,001
		N	87	87
	Teaching performance	Correlation coefficient	0,356**	1
		Significance (Two-tailed)	0,001	-
		N	87	87

Note: Own elaboration (2024).

Table 3 reflects the results analyzing the relationship between the variables "digital competencies" and "teaching performance" using Spearman's correlation coefficient, a suitable method for evaluating relationships between ordinal variables or when a normal distribution of data cannot be assumed. This statistical technique allowed for the measurement of the strength and direction of the association between the study's variables of interest.

The results show that the Spearman correlation coefficient between digital competencies and teaching performance is 0.356. This value indicates a moderate positive correlation, suggesting that as digital competencies of teachers increase, their performance tends to improve as well. The two-tailed significance associated with this coefficient is 0.001, indicating that this correlation is statistically significant, meaning that the likelihood of this result being obtained by chance is very low.

The Spearman correlation analysis reveals a positive and significant correlation between digital competencies and teaching performance. This provides empirical evidence of how the development of digital competencies positively impacts the quality of teaching performance. It highlights the importance of fostering these skills in the current educational context to improve teaching effectiveness. The high reliability of the questionnaire used and the detailed data analysis through SPSS software enhance the validity of these findings and provide valuable recommendations for educational practice and institutional policy formulation..

Discussion

The results obtained in this study support the assertions of Callejas *et al.* (2016), who emphasize that digital competencies for educators include a crucial set of knowledge and skills necessary to effectively integrate technology into the educational environment. These competencies are fundamental for achieving teaching objectives, enhancing teachers' ability to facilitate learning and adapt to the demands of the modern educational context.

This aligns with the view of Flores & Garrido (2019), who describe digital competencies as an organized and creative set of technologies that facilitate student learning. Additionally, Callejas (2016) argues that digital literacy involves not only the development of skills but also the acquisition of knowledge, attitudes, values, and ethics in the use of ICT, with the aim of maximizing the use of resources available on the Internet.

Baldomero (2022) highlights that digital competencies for higher education instructors include information literacy, which encompasses the ability to navigate, filter, evaluate, and manage digital information. The importance of digital communication and collaboration is also emphasized, involving online interaction, participation, and collaboration, as well as the use of netiquette and digital identity management. Digital content creation is another key competency, involving the integration and refinement of platforms, content development, and adherence to copyright and licensing regulations.

Acevedo *et al.* (2020) add that acquiring these digital competencies is crucial in the 21st century, as it facilitates information searching, collaboration, content creation, and the design of met-

hodological strategies to optimize learning. Castro & Artavia (2020) also highlight how these skills enhance administrative tasks and teaching organization, promoting the comprehensive development of students.

Díaz & Loyola (2021) complement this view by noting that digital competencies include internet searching, data management and evaluation, interpersonal interaction, content creation, and data protection. Together, these findings underscore the importance of digital competencies, which extend beyond mere technological tool usage to encompass fundamental aspects necessary for effective and secure performance in the modern educational environment.

On the other hand, the results obtained regarding teaching performance align with observations from Acevedo *et al.* (2020), who highlight that teaching performance manifests in the act of teaching, considering both the characteristics of students and the efforts required for the teacher's professional growth. This directly impacts student learning.

García & Acosta (2012) argue that the goal of teaching performance is to develop students' cognitive skills and achieve high educational quality standards through practices adapted to social realities and student needs, promoting comprehensive development.

Soria *et al.* (2020) add that teaching performance involves the ability to handle complex classroom situations, which depends on students' psychosocial resources and the teacher's skills and attitudes in specific contexts. Optimal performance is demonstrated when the teacher masters the content, applies effective pedagogical mediation, and utilizes instructional and evaluative resources tailored to student needs.

Acosta & Barrios (2023) complement this view by noting that a good teacher must master the subjects, prepare lessons adequately, have experience with learning resources, and show respect for others. Soria *et al. (2020)* also emphasize the importance of pedagogical mediation in creating a conducive learning environment, managing content, motivating students, and appropriately using educational and technological resources.

Lastly, Cuentas *et al.* (2021) highlights that other factors positively influencing teaching performance include job satisfaction, relationships with students, parents, and administrators, and willingness to collaborate. In summary, teachers are responsible for seeking, finding, and utilizing a variety of resources to enrich the learning environment. They must adapt their technological strategies to motivate students and consider individual learning needs to improve their classroom performance.

Conclusions

The results show that the Spearman correlation coefficient between digital competencies and teaching performance is 0.356, indicating a moderate positive correlation. This correlation suggests that as teachers' digital competencies increase, their performance also improves. However,

not all teachers fully leverage the advantages and opportunities offered by digital tools, highlighting the need to elevate digital competencies to ensure better teaching outcomes. The bilateral significance associated with this coefficient is 0.001, indicating that this correlation is statistically significant, meaning the probability that this result occurred by chance is very low.

The positive and significant correlation between digital competencies and teaching performance underscores the importance of enhancing these skills to boost educational quality and professional performance in the university context. This finding emphasizes that teachers with higher digital competencies are not only more efficient in integrating technologies into their teaching methods but also more effective in facilitating learning and adapting to technological and social changes. Therefore, fostering these competencies is essential for achieving more effective and enriching education.

To achieve this goal, it is recommended to implement continuous training programs in digital competencies for university teachers. Educational institutions should invest in technological infrastructure and provide adequate resources and technical support to enable teachers to develop and update their digital skills. Additionally, promoting a culture of innovation and continuous learning, where educators feel motivated and supported to explore new digital tools and methodologies, is crucial. Regular evaluation and feedback on the use of ICT in the classroom can also help identify areas for improvement and ensure that digital competencies are used effectively to enhance teaching performance and, ultimately, educational quality.

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