



Didactic workshops based on information technologies for the development of digital competencies in university professors

Talleres didácticos basado en tecnologías de información para el desarrollo de competencias digitales en docentes universitarios

Torres-Manrique, Julio Iván ^{1*}

Reategui-Ramírez, Tatiana Karol ¹

Campomanes-Lloja, Cesar Marcelo ¹

Vela-del-Águila, Santiago Luis ²

¹Universidad César Vallejo. Escuela de Posgrado. Chiclayo, Perú

²Universidad Nacional Autónoma de Alto Amazonas. Programa Académico de Contabilidad. Yurimaguas, Perú

Received: 15 Oct. 2024 | Accepted: 27 Dic. 2024 | Published: 20 Jan. 2025

Corresponding author*: jtorresman@ucvvirtual.edu.pe

How to cite this article: Torres-Manrique, J. I., Reategui-Ramírez, T. K., Campomanes-Lloja, C. M., & Vela-del-Águila, S. L. (2025). Didactic workshops based on information technologies for the development of digital competencies in university professors. *Revista Científica de Sistemas e Informática*, 5(1), e763. <https://doi.org/10.51252/rcsi.v5i1.817>

ABSTRACT

The digital transformation in higher education has generated the need to strengthen the digital competencies of university teachers, allowing them to effectively integrate information and communication technologies (ICT) in their pedagogical practice; however, previous studies have identified a gap in digital teacher training, especially in regions with limited access. The objective of the study was to design and validate a model of ICT-based didactic workshops to improve the digital competencies of university teachers in a Peruvian institution. The research had a quantitative approach, applied and non-experimental cross-sectional design. A survey was applied to 25 teachers, evaluating four dimensions: appropriation, integration, attitude and commitment to the use of ICT. The results showed that 40% of the teachers had a low level of appropriation, 56% had a medium level of integration and 48% had a favorable attitude towards ICT. The validation of the model obtained scores above 4.4 in sufficiency, clarity and coherence. It is concluded that the model is effective in improving teachers' digital competencies, suggesting its implementation in other educational institutions.

Keywords: higher education; digital education; pedagogical innovation; technological training

RESUMEN

La transformación digital en la educación superior ha generado la necesidad de fortalecer las competencias digitales en los docentes universitarios, permitiéndoles integrar eficazmente las tecnologías de la información y la comunicación (TIC) en su práctica pedagógica; sin embargo, estudios previos han identificado una brecha en la formación digital docente, especialmente en regiones con acceso limitado. El objetivo del estudio fue diseñar y validar un modelo de talleres didácticos basados en TIC para mejorar las competencias digitales de los docentes universitarios en una institución peruana. La investigación tuvo un enfoque cuantitativo, de tipo aplicada y diseño no experimental transversal. Se aplicó una encuesta a 25 docentes, evaluando cuatro dimensiones: apropiación, integración, actitud y compromiso con el uso de TIC. Los resultados mostraron que el 40% de los docentes tenía un nivel bajo en apropiación, el 56% presentaba un nivel medio en integración y el 48% tenía una actitud favorable hacia las TIC. La validación del modelo obtuvo puntuaciones superiores a 4.4 en suficiencia, claridad y coherencia. Se concluye que el modelo es efectivo para mejorar las competencias digitales docentes, sugiriendo su implementación en otras instituciones educativas.

Palabras clave: educación superior; enseñanza digital; innovación pedagógica; capacitación tecnológica



1. INTRODUCTION

The digital transformation has significantly impacted higher education, requiring professors to acquire digital competencies to enhance their classroom performance (Huaman-Yupanqui et al., 2024; Toma et al., 2023; Zaquie, 2024). According to Bayaga et al. (2021) and Panduro-Vasquez et al. (2024), the integration of Information and Communication Technologies (ICT) into teaching and learning processes has proven to be a key factor in the modernization of education, facilitating active methodologies and promoting student autonomy. However, for ICT to be effectively incorporated, it is essential that university professors possess digital skills that enable them to use these tools with an appropriate pedagogical approach (Aspajo-Morales & Angulo-Ríos, 2023).

In the context of higher education, a gap in digital training for professors has been identified, particularly in remote regions (García-Castro et al., 2023). Despite technological advancements and government initiatives to promote ICT use in education, professors still face challenges in the appropriation and application of these tools in their teaching practice (Sánchez-Cruzado et al., 2021). According to Velandia Rodríguez et al. (2022) and Diz-Otero et al. (2023), this issue has become especially relevant in universities after the COVID-19 pandemic, where faculty members continue to rely primarily on traditional teaching strategies, limiting the development of digital competencies in both themselves and their students.

The causes of this situation are diverse. Firstly, the lack of teacher training programs in digital competencies has resulted in insufficient knowledge of ICT usage in teaching (Li & Yu, 2022). Additionally, inadequate technological infrastructure in some educational institutions hinders the effective integration of these tools (Trubavina et al., 2021). Finally, resistance to change among professors and the lack of incentives for continuous training have contributed to the persistence of this issue (Al-Mamary, 2022; Sá et al., 2021).

As a consequence, professors who lack proficiency in ICT struggle to implement innovative methodologies, thereby limiting students' active participation and their preparedness for digitalized work environments (González et al., 2023). Additionally, according to Scully et al. (2021), the lack of digital skills affects educational quality, creating a gap between market demands and the academic training students receive. In the case of accounting professors at the National Autonomous University of Alto Amazonas (the subject of this study), this technological gap directly impacts their ability to teach essential digital tools required in professional practice (Pashanasi-Amasifuen et al., 2024).

Despite the relevance of this issue, a scientific gap remains in the literature regarding specific training models to enhance digital competencies among accounting professors. While various studies have addressed the importance of ICT in education (Abel et al., 2022; Bariu & Chun, 2022; Vieira & Pedro, 2023), few have developed concrete proposals tailored to the specific needs of professors in this discipline, particularly in contexts such as Yurimaguas. This underscores the need for research focused on designing effective training strategies for faculty members in the use of technology for teaching purposes.

Given this scenario, the present study aims to propose a model of didactic workshops based on ICT to strengthen the digital competencies of accounting professors at a public university in Yurimaguas, Peru. Specifically, it seeks to assess the current level of digital competencies among professors, design a training model suited to their needs, and validate its effectiveness through expert evaluation.

2. MATERIALS AND METHODS

2.1. Research design

This study was classified as applied research since it aimed to provide a practical solution to the identified problem concerning faculty training in digital competencies. The research followed a quantitative approach, as it was based on the collection and analysis of numerical data obtained through structured instruments. Regarding the research level, the study was descriptive and propositional, as it not only

characterized the level of digital competencies among faculty members but also proposed a model of didactic workshops based on ICT to enhance these skills. The research design was non-experimental and cross-sectional, given that variables were not manipulated and data were collected at a single point in time.

2.2. Study variables

The study considered the ICT-based didactic workshop model as the independent variable, defined as a set of training strategies designed to enhance the pedagogical use of digital tools in university teaching. The dependent variable was faculty digital competencies, understood as the ability to effectively use ICT in educational settings. Digital competencies were analyzed through four dimensions: ICT appropriation, ICT-based teaching methodology, favorable attitude towards ICT, and active commitment to ICT use. A total of 15 indicators were examined, allowing for a detailed assessment of the proficiency level in each dimension.

2.3. Unit of analysis

The unit of analysis comprised faculty members from the Faculty of Accounting and International Business at a university in Yurimaguas. The total population consisted of 25 faculty members, all of whom participated in the study. Due to the small population size, probabilistic sampling was not conducted; instead, a census sampling approach was applied, considering the entire faculty group.

2.4. Data collection instrument

Both documentary and field techniques were employed for data collection. The documentary technique facilitated the gathering of theoretical information on digital competencies and their development in university teaching. In the fieldwork, the survey technique was used, with a structured questionnaire serving as the primary measurement instrument.

The questionnaire consisted of ordinal scale items, with response options based on the frequency of ICT use and proficiency, utilizing a five-point Likert scale: Never, Almost Never, Sometimes, Almost Always, and Always. To ensure the instrument's validity, an expert judgment validation process was carried out, in which specialists assessed the relevance and clarity of the items concerning the study variable. Additionally, a pilot test was conducted on a small sample to verify the instrument's reliability, calculating a Cronbach's alpha coefficient of 0.841.

2.5. Data analysis

The collected data were organized and processed using SPSS software. Descriptive statistical techniques were applied to analyze the frequency and distribution of responses, enabling the characterization of faculty members' digital competency levels. Frequency tables and graphical representations were utilized to facilitate result interpretation.

2.6. Ethical Considerations

The research adhered to the ethical principles of autonomy, beneficence, non-maleficence, and justice, ensuring the voluntary participation and confidentiality of faculty members. Informed consent was obtained from each participant, guaranteeing anonymity and the exclusive use of the data for academic purposes. Additionally, the study followed the guidelines of APA (7th edition) to prevent plagiarism and ensure academic integrity. Data collection and storage were conducted securely, complying with ethical standards for educational research.

3. RESULTS

3.1. Digital competencies of university faculty

Table 1 presents the level of digital competencies among university faculty members, categorized into four dimensions: appropriation, integration, attitude, and commitment. In the ICT appropriation dimension,

40% of faculty members were at a low level, while 48% reached a medium level, and only 12% demonstrated a high level. This finding indicates that although most faculty members have a moderate familiarity with ICT, a significant proportion still lacks proficiency, highlighting the need for training programs to strengthen this competency.

Table 1. Level of digital competencies of university faculty by dimensions

Level	Appropriation		Integration		Attitude		Commitment	
	f	%	f	%	f	%	f	%
Low	10	40	8	32	5	20	7	28
Medium	12	48	14	56	8	32	11	44
High	3	12	3	12	12	48	7	28
Total	25	100	25	100	25	100	25	100

Regarding the integration of ICT in teaching, 32% of faculty members demonstrated a low level, 56% were at a medium level, and only 12% reached a high level. These results suggest that while most faculty members incorporate ICT into their teaching methodologies, their use is not entirely efficient or innovative. This could be attributed to insufficient training in pedagogical strategies that effectively integrate technology, limiting its impact on student learning.

Concerning attitudes toward ICT, the data indicate that 20% of faculty members have an unfavorable attitude, 32% remain neutral, and 48% hold a positive attitude. The fact that nearly half of the faculty members exhibit a positive attitude is an encouraging sign for the adoption of technology in the classroom. However, the presence of faculty members with neutral or negative attitudes may pose a barrier to the effective implementation of digital strategies in education.

Finally, in the commitment to ICT dimension, results reveal greater variability: 28% of faculty members demonstrated a low level, 44% were at a medium level, and 28% reached a high level. This indicates that while a significant portion of faculty members are committed to using technology, a segment still requires greater motivation and incentives to actively engage with ICT in their teaching practices. These findings underscore the need for training strategies that not only reinforce technical knowledge but also foster a culture of innovation and participation in the use of digital tools.

3.2. Proposed model

The proposed model for strengthening digital competencies among accounting faculty in Yurimaguas follows a structured approach encompassing interconnected stages, allowing for a progressive and adaptive training process. The model begins with the recognition of difficulties, where the main gaps in faculty members' use of ICT are identified. This phase is crucial, as it establishes a diagnosis of the levels of appropriation, integration, and attitude toward technology in teaching, providing a solid foundation for subsequent stages.

Based on the initial diagnosis, general and specific objectives are established to guide the model's design. The general objective focuses on enhancing faculty members' digital competencies, while the specific objectives outline key aspects such as assessing current competency levels, planning training strategies, and validating the model's impact. These objectives shape the methodological approach, ensuring that the proposed activities are relevant and aligned with the faculty's specific needs.

The methodological phase of the model unfolds in three key stages: initial diagnosis, model design, and pilot implementation. The initial diagnosis gathers data on faculty members' digital competency levels, while the model design focuses on structuring a training program that integrates ICT tools into teaching methodologies. Finally, the pilot implementation applies the model to a selected group of faculty members, allowing for an evaluation of its effectiveness before broader application.

The next phase of the model is impact assessment, where the results obtained after the model's implementation are analyzed. This stage evaluates the evolution of faculty members' digital competency levels, measuring changes in their appropriation and use of ICT in pedagogical practices. Additionally, faculty perceptions regarding the model's usefulness are collected, identifying strengths and areas for improvement. This assessment provides essential insights into whether the model has achieved its objectives and if adjustments are needed.

The expected outcomes include enhanced proficiency in digital tools, the effective integration of innovative teaching methodologies using ICT, and a more positive attitude toward technology in education. Faculty members are expected to apply the acquired knowledge in their teaching practice, fostering a more dynamic learning environment aligned with the demands of the digital era.

The model also includes a refinement and improvement phase, where modifications are incorporated based on evaluation results and feedback. This flexible approach allows for continuous optimization and adaptation to different educational contexts, ensuring its sustainability and applicability over time. Through this structured process, the model progressively enhances digital competencies among faculty members, facilitating their integration into teaching and contributing to a more innovative and responsive higher education system. Figure 1 illustrates the proposed model's graphical framework.

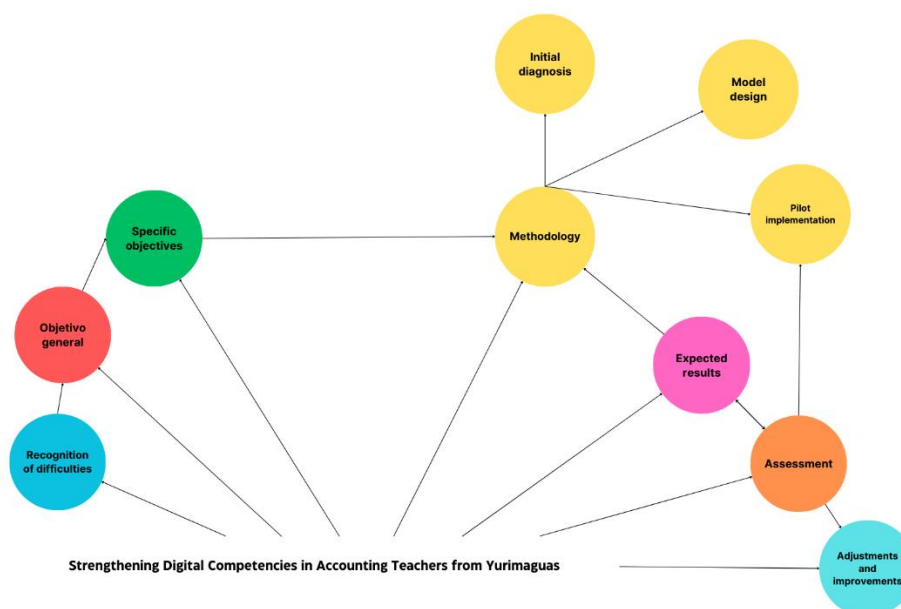


Figure 1. Diagram of the proposed model

3.3. Model validation

The validation of the proposed model was conducted through an evaluation by four experts, who assessed its sufficiency, clarity, and coherence. The results reflected positive ratings in each of the evaluated dimensions. Regarding sufficiency, experts highlighted the relevance of the educational content (4.6), the quality of explanatory writing (4.4), and the clarity of guidelines for infographic development (4.6). These findings indicate that experts considered the model to provide relevant and well-structured information for its application in educational environments.

Regarding clarity, experts positively evaluated the effectiveness of interactive activities (4.6), the ability of infographics to simplify complex concepts (4.6), and their impact on motivation and interest in reading (4.8). These results underscore the model's potential to foster a more dynamic learning process.

In terms of coherence, the evaluation focused on the model's adaptability to students' needs (4.4) and its impact on learning and academic development (4.6), confirming that the proposed model is consistent and

aligned with educational objectives. Overall, the average ratings ranged between 4.4 and 4.8, demonstrating that the model is considered viable and effective by experts in the field of education.

4. DISCUSSION

The results revealed that a significant proportion of university faculty members exhibit medium or low levels of digital competencies, confirming the existing gap in educators' digital training. These findings align with those reported by Sánchez-Cruzado et al. (2021), who identified that the lack of training in digital technologies has led to difficulties in integrating ICT into teaching, particularly after the pandemic. Similarly, Trubavina et al. (2021) argue that the development of digital competencies among educators remains a challenge due to the scarcity of training programs tailored to their specific needs.

From a methodological perspective, the implementation of ICT-based didactic workshops enhances faculty members' appropriation and use of digital tools. This finding supports the assertion by Abel et al. (2022) that teacher training models combining theoretical and practical approaches have a greater impact on the acquisition of digital competencies. Likewise, Diz-Otero et al. (2023) emphasize that effective training programs should include interactive strategies and continuous assessments to ensure sustained improvement over time—elements that were incorporated into the proposed model.

The analysis of the attitudinal dimension revealed that nearly half of the evaluated faculty members demonstrated a positive attitude toward using ICT in teaching, suggesting a favorable disposition for integrating new technologies into the classroom. This result is consistent with the findings of Sá et al. (2021), who highlighted that motivation and perceived usefulness are key factors in the adoption of digital tools. However, the presence of faculty members with neutral or negative attitudes underscores the importance of incorporating motivational strategies and ongoing support within training programs, as suggested by Bayaga et al. (2021).

In terms of commitment to ICT, significant variability was identified among faculty members, with a considerable group demonstrating high levels of engagement, while others showed lower levels of involvement. These results align with the findings of García-Castro et al. (2023), who emphasize that faculty members' commitment to technology is directly related to institutional culture and the support provided by universities. In this regard, the implementation of institutional policies that promote ICT use in teaching could contribute to enhancing faculty members' participation and engagement with digital tools.

One of the key contributions of this study was the validation of the model through expert judgment, whose results confirmed the sufficiency, clarity, and coherence of the proposal. This finding aligns with the assertion of Vieira & Pedro (2023), who highlight that expert evaluation is a fundamental strategy for ensuring the feasibility and applicability of ICT-based educational models. Furthermore, the high scores obtained in indicators related to the effectiveness of interactive activities and improvement in reading comprehension suggest that the designed model holds strong potential for replication in other educational contexts.

Finally, this study contributes to the field of digital education by proposing a structured approach for faculty training in ICT, providing evidence of its positive impact on educators' professional development. However, the need for longitudinal studies is recognized to assess the sustainability of results over time. Additionally, future research could explore the influence of external factors, such as access to technological infrastructure and institutional support, on the effectiveness of digital training programs for university faculty members.

CONCLUSIONS

This study highlighted the need to strengthen digital competencies among university faculty, particularly in areas such as the appropriation and integration of ICT in teaching. The results confirmed that a significant

portion of faculty members still face challenges in the pedagogical use of digital tools, justifying the implementation of specialized training models. The proposed ICT-based didactic workshop model proved to be an effective strategy for enhancing these competencies, validated by experts in terms of sufficiency, clarity, and coherence. This finding suggests that the model can be replicated in other educational contexts with similar characteristics, facilitating the transition toward more innovative teaching methodologies aligned with the demands of the digital environment.

From a practical perspective, implementing this model has direct implications for improving educational quality, as it will enable faculty members to develop more dynamic teaching strategies adapted to students' current needs. Additionally, integrating ICT into teaching not only enhances the teaching-learning process but also increases faculty motivation and commitment to technological advancement. However, it is recommended that universities adopt institutional policies that promote continuous training and provide adequate technological infrastructure to ensure the success of these programs. Future studies could focus on evaluating the long-term impact of the model and exploring its application in other academic disciplines.

FINANCING

The authors did not receive sponsorship to carry out this study-article.

CONFLICT OF INTEREST

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

AUTHORSHIP CONTRIBUTION

Conceptualization; Data Curation; Formal Analysis; Research; Methodology; Visualization; Validation; Writing - original draft; Writing - revision and editing: Torres-Manrique, J. I., Reategui-Ramírez, T. K., Campomanes-Lloja, C. M. and Vela-del-Águila, S. L.

REFERENCES

- Abel, V. R., Tondeur, J., & Sang, G. (2022). Teacher Perceptions about ICT Integration into Classroom Instruction. *Education Sciences*, 12(9), 609. <https://doi.org/10.3390/educsci12090609>
- Al-Mamary, Y. H. S. (2022). Examining the factors affecting the use of ICT in teaching in Yemeni schools. *Journal of Public Affairs*, 22(1). <https://doi.org/10.1002/pa.2330>
- Aspajo-Morales, M. de J., & Angulo-Ríos, L. A. (2023). Competencias digitales en docentes de educación básica: Estudio en una institución educativa peruana. *Revista Amazonía Digital*, 2(1), e281. <https://doi.org/10.55873/rad.v2i1.281>
- Bariu, T. N., & Chun, X. (2022). Influence of teachers attitude on ict implementation in kenyan universities. *Cogent Education*, 9(1). <https://doi.org/10.1080/2331186X.2022.2107294>
- Bayaga, A., Bossé, M. J., Sevier, J., Fountain, C., Williams, D., Bosire, S., & Blignaut, S. (2021). University Faculty Opinions of Preservice Teachers' Technological Readiness. *Canadian Journal of Science, Mathematics and Technology Education*, 21(1), 44–64. <https://doi.org/10.1007/s42330-021-00138-6>
- Diz-Otero, M., Portela-Pino, I., Domínguez-Lloria, S., & Pino-Juste, M. (2023). Digital competence in secondary education teachers during the COVID-19-derived pandemic: comparative analysis. *Education + Training*, 65(2), 181–192. <https://doi.org/10.1108/ET-01-2022-0001>
- García-Castro, J. C., Torres-Delgado, W., Cárdenas-García, Á., & Chávez-Bazán, M. (2023). Tutoría en la

- Universidad Nacional de San Martín, Tarapoto, Perú. *UNAAACIENCIA-PERÚ*, 2(2), e44. <https://doi.org/10.56926/unaaaciencia.v2i2.44>
- González, C., Ponce, D., & Fernández, V. (2023). Teachers' experiences of teaching online during COVID-19: implications for postpandemic professional development. *Educational Technology Research and Development*, 71(1), 55–78. <https://doi.org/10.1007/s11423-023-10200-9>
- Huaman-Yupanqui, N. C., Zapana-Halire, Y., Ulloa-Gallardo, N. J., & Vilchez Navarro, Y. (2024). Implementación de un sistema web para mejorar la gestión académica en universidades: un estudio de caso. *Revista Amazonía Digital*, 3(2), e289. <https://doi.org/10.55873/rad.v3i2.289>
- Li, M., & Yu, Z. (2022). Teachers' Satisfaction, Role, and Digital Literacy during the COVID-19 Pandemic. *Sustainability*, 14(3), 1121. <https://doi.org/10.3390/su14031121>
- Panduro-Vasquez, G. G., Cjuno-Rojas, J. A., Ulloa-Gallardo, N. J., & Isuiza-Pérez, D. D. (2024). Desarrollo de un sistema web para la gestión de trámites documentarios en una entidad educativa local peruana. *Revista Amazonía Digital*, 3(2), e290. <https://doi.org/10.55873/rad.v3i2.290>
- Pashanasi-Amasifuen, B., Palomino-Alvarado, G. del P., & Gárate-Ríos, J. (2024). Desempeño laboral en una universidad pública de la Amazonía Peruana. *UNAAACIENCIA-PERÚ*, 3(1), e60. <https://doi.org/10.56926/unaaaciencia.v3i1.60>
- Sá, M. J., Santos, A. I., Serpa, S., & Miguel Ferreira, C. (2021). Digitainability—Digital Competences Post-COVID-19 for a Sustainable Society. *Sustainability*, 13(17), 9564. <https://doi.org/10.3390/su13179564>
- Sánchez-Cruzado, C., Santiago Campión, R., & Sánchez-Compañía, M. T. (2021). Teacher Digital Literacy: The Indisputable Challenge after COVID-19. *Sustainability*, 13(4), 1858. <https://doi.org/10.3390/su13041858>
- Scully, D., Lehane, P., & Scully, C. (2021). 'It is no longer scary': digital learning before and during the Covid-19 pandemic in Irish secondary schools. *Technology, Pedagogy and Education*, 30(1), 159–181. <https://doi.org/10.1080/1475939X.2020.1854844>
- Toma, F., Ardelean, A., Grădinaru, C., Nedelea, A., & Diaconu, D. C. (2023). Effects of ICT Integration in Teaching Using Learning Activities. *Sustainability*, 15(8), 6885. <https://doi.org/10.3390/su15086885>
- Trubavina, I., Dotsenko, S., Naboka, O., Chaikovskiy, M., & Meshko, H. (2021). Developing digital competence of teachers of Humanitarian disciplines in the conditions of COVID-19 quarantine measures. *Journal of Physics: Conference Series*, 1840(1), 012052. <https://doi.org/10.1088/1742-6596/1840/1/012052>
- Velandia Rodriguez, C. A., Mena-Guacas, A. F., Tobón, S., & López-Meneses, E. (2022). Digital Teacher Competence Frameworks Evolution and Their Use in Ibero-America up to the Year the COVID-19 Pandemic Began: A Systematic Review. *International Journal of Environmental Research and Public Health*, 19(24), 16828. <https://doi.org/10.3390/ijerph192416828>
- Vieira, C. R., & Pedro, N. (2023). Weaknesses of ICT integration in the initial teacher education curriculum. *Computers and Education Open*, 5, 100150. <https://doi.org/10.1016/j.caeo.2023.100150>
- Zaqueu, L. (2024). Desafíos y oportunidades para la transformación digital en las instituciones de educación superior de Mozambique. *Revista Científica de Sistemas e Informática*, 4(2), e690. <https://doi.org/10.51252/rcsi.v4i2.690>