# Validation of an instrument to diagnose the integration of ICT in higher education

## Validación de un instrumento para diagnosticar la integración de las TIC en la educación superior

Roberth Javier Castillo Chávez
https://orcid.org/0009-0008-9004-4803
roberth.castillo@unl.edu.ec
Universidad Nacional de Loja
Loja, Ecuador.

María de los Ángeles Coloma Andrade
https://orcid.org/0000-0002-2432-4574
maría.coloma@unl.edu.ec
Universidad Nacional de Loja
Loja, Ecuador.

Received: 02/02/2025 Accepted: 27/04/2025

2026. V6. N 1.

**Abstract**

Currently, Information and Communication Technologies (ICT) in higher education allow teaching processes to be transformed in order to promote meaningful learning. The objective of this study was to validate a diagnostic instrument on the key dimensions for the integration of ICT in the teaching-learning process at the higher level. To do this, a deductive method was used, with a quantitative approach, descriptive-explanatory scope and cross-sectional design. The target population was made up of five experts in ICT applied to higher education. Through a bibliographic review, four fundamental dimensions were identified: use and knowledge of ICTs, integration of technological resources in teaching practice, teacher training and innovation in ICT, and ethical component in teaching work. From these dimensions, a diagnostic instrument was constructed whose items were assessed using a Likert-type scale. The validation of the instrument was carried out through Lawshe's model, with the participation of five experts. As a result, 22 valid items were selected. The reliability analysis yielded a "strong correlation"; Cronbach's alpha coefficient was classified as "excellent", and Fleiss's Kappa coefficient showed "almost perfect" agreement in the assessment of the criteria of theoretical foundation, sufficiency, clarity, coherence, quality and relevance.

**Keywords**: measuring instrument, ICT, higher education.

## Resumen

En la actualidad, las Tecnologías de la Información y la Comunicación (TIC) en la educación superior permiten transformar los procesos de enseñanza con el fin de promover aprendizajes significativos. El objetivo de este estudio fue validar un instrumento de diagnóstico sobre las dimensiones clave para la integración de las TIC en el proceso de enseñanza-aprendizaje en el nivel superior. Para ello, se empleó un método deductivo, con enfoque cuantitativo, alcance descriptivo-explicativo y diseño transversal. La población objetivo estuvo conformada por cinco expertos en TIC aplicadas a la educación superior.

Mediante una revisión bibliográfica, se identificaron cuatro dimensiones fundamentales: uso y conocimiento de las TIC, integración de recursos tecnológicos en la práctica docente, formación docente e innovación en TIC y componente ético en la labor docente. A partir de estas dimensiones, se construyó un instrumento de diagnóstico cuyos ítems fueron valorados mediante una escala tipo Likert. La validación del instrumento se realizó a través del modelo de Lawshe, con la participación de cinco expertos. Como resultado, se seleccionaron 22 ítems válidos. El análisis de confiabilidad arrojó una “correlación fuerte”; el coeficiente Alfa de Cronbach fue clasificado como “excelente”, y el coeficiente Kappa de Fleiss mostró un acuerdo “casi perfecto” en la valoración de los criterios de fundamento teórico, suficiencia, claridad, coherencia, calidad y relevancia.

**Palabras clave**: instrumento de medición, TIC, educación superior.

## Introduction

In recent years, the integration of Information and Communication Technologies (ICT) in higher education has significantly transformed educational systems, leading to notable advancements as well as persistent challenges. Espíritu et al. (2022) emphasize that, in response to the urgent need to rapidly adopt virtual education modalities, universities exhibited both strengths and weaknesses in their technological preparedness. In Latin America, UNESCO (2021) highlights significant progress in the use of ICT; however, inequalities in access and teacher training persist, underscoring the urgency to strengthen both technological infrastructure and pedagogical capacities to maximize their impact on learning.

In the case of Ecuador, the incorporation of ICT has contributed to improving educational quality, although barriers such as insufficient technological infrastructure and limitations in teacher training remain (Cruz Pérez et al., 2020). Despite these advancements, there is a lack of validated instruments that assess the multidimensional integration of ICT, which limits the capacity to make informed pedagogical decisions (Espíritu et al., 2022). In this context, the present research aims to validate a diagnostic instrument that assesses the key dimensions of ICT integration in the teaching-learning process in higher education, aiming to support effective educational interventions.

The general objective of the study is to validate the diagnostic instrument for the dimensions of ICT integration in the teaching-learning process in higher education. This is divided into two specific objectives: (1) to identify the key dimensions of this integration, and (2) to construct a reliable and relevant diagnostic instrument.

Diagnostic instruments in the educational field are essential for identifying the needs, strengths, and weaknesses of the teaching-learning process, enabling educators to personalize instruction and design effective pedagogical strategies (Islas Torres, 2018). The validity and reliability of these instruments are crucial aspects that ensure the accuracy and relevance of the obtained results. Furthermore, the incorporation of technology in these processes facilitates data collection and analysis, thereby optimizing their application (Abbas et al., 2021).

Proper validation of these instruments significantly contributes to improving teaching quality. According to Pérez et al. (2021), this process increases the accuracy of result interpretation, strengthening informed decision-making. In virtual educational environments, validation becomes even more relevant, as it allows for the dynamic adaptation of pedagogical strategies (Cruz Pérez et al., 2020; Raza et al., 2021).

The integration of ICT has transitioned from being a complementary resource to becoming an essential component of the educational process. Castells (2000) highlights that, in the knowledge society, ICT is indispensable for academic development, as it broadens access to information, fosters collaboration, and enhances pedagogical innovation. The effectiveness of its implementation largely depends on the digital competencies of educators, who must engage in continuous training to strategically employ these tools (Basantes-Andrade et al., 2022).

Active methodologies such as Project-Based Learning (PBL) or collaborative work are strengthened by the use of ICT, transforming the learning process into a student-centered approach (Kumar & Priyanka, 2023). Additionally, technological integration encompasses ethical and pedagogical dimensions. The ethical component

promotes self-directed learning, responsibility, and the construction of knowledge from a conscious pedagogical practice (Solano, 2023). Digital tools allow for more efficient monitoring of academic performance and the adjustment of teaching strategies according to students' needs (Di Michele et al., 2023).

Moreover, technological innovation drives the creation of more dynamic, accessible, and effective academic environments (Coello & Alcívar, 2023). Collectively, these elements demonstrate that proper integration of ICT represents an opportunity to personalize learning, improve teaching quality, and advance towards a more inclusive, updated, and transformative higher education.

## Methodology

This research aimed to validate a diagnostic instrument for the dimensions of ICT integration in the teaching-learning process in higher education, utilizing a quantitative approach. According to Montero et al. (2024), this approach allows for the collection of precise data through statistical methods, ensuring replicability and minimizing biases. In line with this, a deductive method with descriptive-explanatory scope was employed, allowing for a detailed analysis of the variables alongside the interpretation of their relationships (Caicedo and Goyes, 2024; Corona and Fonseca, 2023). Additionally, a cross-sectional design was adopted, enabling the collection of information at a specific point in time, thereby facilitating the evaluation of the instrument's validity in a specific temporal context (Jiménez, 2024).

The target population comprised five ICT experts, all holding doctoral degrees (PhD) and possessing extensive experience in the field of higher education. They were intentionally selected for their ability to provide informed judgments about the instrument's relevance and quality (Vizcaíno et al., 2023). For data collection, a structured questionnaire was utilized based on the dimensions proposed by Solano (2023) and Castaño (2022), and a three-point Likert scale (Always, Occasionally, Never) was applied to assess each item. This instrument was designed to effectively measure the integration of ICT in the educational process from multiple relevant dimensions.

The technique employed was a survey, which was administered in a Test and Re-test modality to a sample of 10 anonymous educators to evaluate the instrument's reliability (Espinosa, 2024). For data processing and analysis, Microsoft Excel spreadsheets were used to organize the results and apply basic statistical formulas for questionnaire validation.

The results obtained provided a solid foundation for validating the instrument, highlighting its practical utility in assessing ICT integration in higher education. The combination of quantitative methods, the rigor in selecting experts, and the use of statistical tools ensured both the reliability and validity of the study. Consequently, the findings significantly contribute to educational research by offering a replicable and useful methodological framework for future studies seeking to evaluate the implementation of technologies in higher education environments.

## Results and discussion

To address the first specific objective, which involved identifying the dimensions of ICT integration in the teaching-learning process in higher education, a comprehensive search was conducted in national and international academic repositories. From this review, two postgraduate theses by Solano (2023) and Castaño (2022) were selected, from which four fundamental dimensions were identified.

**Table 1**

*First dimension - Use and knowledge of ICT*

| Dimension | Items | Author(s): | Link: |
|---|---|---|---|
| Use and knowledge of ICT. | Has knowledge of ICT in the teaching-learning process. | Castaño (2022) | http://dx.doi.org/10.57799/11227/2040 |
| | Uses ICT tools and/or applications autonomously. | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316695 |
| | Implements a password protection system and ensures the privacy of the device. | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316696 |
| | Uses assistive technology and/or appropriate | Solano | https://dialnet. |

| | | | |
|---|---|---|---|
| | educational software for students with diverse educational needs. | (2023) | unirioja.es/servlet/tesis?codigo=316703 |
| | Implements file-sharing tools such as Emule, Torrents, among others. | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316698 |
| | Utilizes email, forums, messaging, social networks, and virtual worlds. | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316699 |
| | Develops computer maintenance and configures hardware and software components. | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316699 |
| | Manages forums or reflection spaces regarding ICT. | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316711 |

***Note.*** Adapted from Solano (2023) and Castaño (2022).

The first dimension is "Use and knowledge of ICT," as shown in Table 1. This dimension evaluates essential competencies related to the management and implementation of technology in educational contexts. Items related to digital security and privacy, the use of assistive technology for students with special educational needs, communication through digital tools, device configuration, and the creation of reflective spaces regarding the pedagogical use of ICT were adapted. Additionally, the item from Castaño (2022) was included: "Uses ICT tools and/or applications autonomously."

**Table 2**

*Second dimension - Integration of technological resources in teaching practice*

| Dimension | Items | Author(s): | Link: |
|---|---|---|---|
| Integration of technological resources in teaching practice. | Uses collaborative online tools such as Google Drive, wikis, among others. | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316697 |
| | Uses digital materials to develop the content of the topics addressed (books, articles, databases, web addresses, blogs, among others). | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316719 |
| | Presents references that support the development of the topics discussed. | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316720 |
| | Utilizes learning environments in the classroom where technologies are an integrated component. | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316706 |
| | Uses ICT in teaching practice. | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316707 |
| | Considers that the use of ICT fosters autonomy in learning. | Castaño (2022) | http://dx.doi.org/10.57799/11227/2040 |
| | Uses videoconferencing tools such as Adobe | Solano | https://dialnet. |

| | | | |
|---|---|---|---|
| | Connect, Skype, Google Hangouts, among others. | (2023) | unirioja.es/servlet/tesis?codigo=316699 |
| | Implements online publishing tools, RSS readers, presentation editors, among others. | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316699 |

***Note.*** Adapted from Solano (2023) and Castaño (2022).

Following this, Table 2 presents the dimension "Integration of Technological Resources in Teaching Practice," based on the studies by Solano (2023), who evaluates the use of digital tools by educators to enhance the teaching-learning process. The most notable items from the author include the use of collaborative online platforms such as Google Drive and wikis, the utilization of digital materials such as databases and blogs, the referencing of digital bibliographies, the implementation of technology within the classroom, and the use of ICT in teaching practice. Additionally, it analyzes educators' perceptions regarding autonomy in learning through ICT and the use of videoconferencing tools like Adobe Connect, Zoom, and Google Meet. The use of presentation editors and RSS readers for educational content publication is also considered. These aspects allow for an evaluation of how ICT has been integrated into teaching and its impact on educational dynamics. The next dimension will be presented in Table 3, addressing another key aspect of technology adoption in teaching and learning.

**Table 3**

*Third dimension - Teacher training and innovation in ICT*

| Dimension | Items | Author(s): | Link: |
|---|---|---|---|
| Teacher training and innovation in ICT. | Considers prior preparation to integrate ICT into teaching processes. | Castaño (2022) | http://dx.doi.org/10.57799/11227/2040 |
| | ICT can support pedagogical processes in the classroom. | Castaño (2022) | http://dx.doi.org/10.57799/11227/2040 |
| | The integration of ICT in teaching processes could influence student learning. | Castaño (2022) | http://dx.doi.org/10.57799/11227/2040 |
| | Considers that ICT influences students' learning outcomes and, hence, academic results. | Castaño (2022) | http://dx.doi.org/10.57799/11227/2040 |
| | Conducts training activities to improve the use of ICT. | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316712 |
| | Has conducted activities supported by the use of ICT in the last five years. | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316713 |
| | Maintains a list of relevant websites. | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316714 |
| | Has access to platforms and repositories of digital resources. | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316715 |

***Note.*** Adapted from Solano (2023) and Castaño (2022).

The third dimension, “Teacher Training and Innovation in ICT,” is documented in Table 3. This category underscores the necessity of adequate prior training in technology. Solano (2023) emphasizes the importance of teacher training for the effective use of ICT and its influence on the educational process, while Castaño (2022) adds that ICT impacts learning outcomes and highlights the need for continuous training in technological innovation. These items demonstrate the connection between professional teacher training and the effective incorporation of technology in the classroom.

**Table 4**

*Fourth dimension - Ethical component in teaching*

| Dimension | Items | Author(s): | Link: |
|---|---|---|---|
| Ethical component in teaching. | Uses technology as a means to conduct training activities related to the specialty. | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316704 |
| | Considers ethical and legal issues such as information reproduction through citation norms and copyright. | Castaño (2022) | https://dialnet.unirioja.es/servlet/tesis?codigo=316705 |
| | Considers that bibliographic references align with the academic level of the content to be developed. | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316721 |
| | Considers that ICT contributes to the search for references in second languages such as English. | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316722 |
| | Considers that the bibliography is presented in accordance with international standards such as APA, ISO 690, MLA, among others. | Solano (2023) | https://dialnet.unirioja.es/servlet/tesis?codigo=316723 |

***Note.*** Adapted from Solano (2023) and Castaño (2022).

Finally, Table 4 presents the fourth dimension on the “Ethical Component in Teaching,” highlighting three key items related to the responsible use of information sources. The first item, taken from Castaño (2022), states: “Considers ethical and legal issues such as information reproduction through citation norms and copyright.” Continuing with items from Solano (2023), it emphasizes: “Considers that bibliographic references align with the academic level of the content to be developed,” “Uses technology as a means to conduct training activities related to the specialty,” “Considers that ICT contributes to the search for references in second languages such as English,” and “Considers that the bibliography is presented in accordance with international standards such as APA, ISO 690, MLA, among others.”

After conducting the literature review, the second specific objective was addressed by constructing an instrument based on the works of Solano (2023) and Castaño (2022), titled: “Integration of ICT in the Teaching and Learning Process in Higher Education,” consisting of four dimensions: use and knowledge of ICT, integration of technological resources in teaching practice, teacher training and innovation in ICT, and the ethical component in teaching. Each dimension includes between 5 to 8 items rated on a Likert scale: Always (3), Occasionally (2), Never (1). As shown in Table 5, a summary of the foundation was also constructed for the diagnostic instrument.

**Table 5**

*Summary of the theoretical foundation of the research instrument*

| | | | |
|---|---|---|---|
| **Name of the Instrument:** | Integration of ICT in the teaching-learning process in higher education. | | |
| **Theoretical foundation of the research:** | Methodological strategy for the integration of ICT in the teaching-learning process by higher education teachers in Colombia. | **Author:** | Ernesto Solano (2023) |
| **Variable/s** | **Dimension/s** | **No. of Items** | **Author** |

| | | | |
|---|---|---|---|
| Integration of ICT in the teaching-learning process. | Use and knowledge of ICT. | 8 | Solano (2023) Castaño (2022) |
| | Integration of technological resources in teaching practice. | 8 | Solano (2023) Castaño (2022) |
| | Teacher training and innovation in ICT. | 8 | Solano (2023) Castaño (2022) |
| | Ethical component in teaching. | 5 | Solano (2023) Castaño (2022) |

***Note.*** Data obtained from the content matrix created.

Continuing with the results of the general objective, the analysis of the theoretical basis of the research instrument began by examining the coherence and order among the items. The application of model proposed by Lawshe (1975) was implemented for content validity, measuring the extent to which the instrument adequately represents the construct it aims to measure. Five higher education faculty members with PhD degrees specialized in ICT for higher education were selected to assess the validity of the items, making revisions to wording and order. Initially, 29 items were proposed, and 22 were selected as relevant to the construct in question, as shown in Table 6 below:

**Table 6**

*Results of the application of Lawshe's model for content validity*

| No.I. | Ne | IVC | Interpretation |
|---|---|---|---|
| I.1. | 0 | -1 | Item to be removed. |
| I.2. | 5 | 1 | Valid item. |
| I.3. | 5 | 1 | Valid item. |
| I.4. | 5 | 1 | Valid item. |
| I.5. | 0 | -1 | Item to be removed. |
| I.6. | 5 | 1 | Valid item. |
| I.7. | 5 | 1 | Valid item. |
| I.8. | 5 | 1 | Valid item. |
| I.9. | 5 | 1 | Valid item. |
| I.10. | 5 | 1 | Valid item. |
| I.11. | 5 | 1 | Valid item. |
| I.12. | 5 | 1 | Valid item. |
| I.13. | 5 | 1 | Valid item. |
| I.14. | 5 | 1 | Valid item. |
| I.15. | 5 | 1 | Valid item. |
| I.16. | 5 | 1 | Valid item. |
| I.17. | 5 | 1 | Valid item. |
| I.18. | 5 | 1 | Valid item. |
| I.19. | 0 | -1 | Item to be removed. |
| I.20. | 5 | 1 | Valid item. |
| I.21. | 5 | 1 | Valid item. |
| I.22. | 0 | -1 | Item to be removed. |
| I.23. | 0 | -1 | Item to be removed. |
| I.24. | 5 | 1 | Valid item. |
| I.25. | 0 | -1 | Item to be removed. |
| I.26. | 5 | 1 | Valid item. |

| | | | |
|---|---|---|---|
| I.27. | 5 | 1 | Valid item. |
| I.28. | 0 | -1 | Item to be removed. |
| I.29. | 5 | 1 | Valid item. |

***Note.*** Data obtained from the content matrix created.

Thus, Table 6 shows the results of applying Lawshe's model, which establishes that validation requires all data to be quantitative and suggests that the number of experts should be between 5 to 10 to ensure the reliability of evaluations. Each expert assessed the items of the instrument using a three-point scale: not relevant, useful but not essential, and essential. For calculating the Content Validity Index (CVI), a minimum value of 0.78 is required to consider an item as having acceptable content validity. Consequently, of the 29 items evaluated, 7 were removed, and 22 were deemed valid for inclusion in the construct.

Additionally, an external reliability test of the research instrument with the 22 resulting items was conducted using Pearson's R coefficient, which allowed for analysis of the relationship between the study variables. This involved applying the Test-Retest method to evaluate the external consistency of the instrument. From this analysis, a coefficient of 0.89 was obtained, indicating a "strong correlation," as shown in Table 7 below:

**Table 7**

*Results of the reliability test of the instrument "integration of ICT in the teaching-learning process"*

| Reliability test using Pearson's R | | |
|---|---|---|
| **Test** | **Re-Test** | **Coefficient of Temporal Stability** |
| 220 responses collected | Variation of 3 out of 220 responses | 0.894 |

***Note.*** Data obtained from the reliability test conducted on the research instrument.

Furthermore, the internal reliability or consistency of the research instrument was evaluated using Cronbach's Alpha coefficient, which allowed assessment of the coherence among the items forming the instrument. This determined each item's contribution to measuring the overall construct. The calculation took into account the total number of items, the sum of individual variances, and the total variance generated; the result obtained was a coefficient of 0.91, classified as "Excellent." The detailed values are shown in Table 8.

**Table 8**

*Internal consistency of the instrument - Cronbach's Alpha*

| Reliability test | |
|---|---|
| **Number of Items=** | 22 |
| **Sum of Variances=** | 4.77 |
| **Variance of the Sum of the Items=** | 39.16 |
| **Cronbach's Alpha=** | 0.91 |

***Note.*** Data obtained from the reliability test conducted on the research instrument.

Finally, the five experts evaluated the instrument based on six key criteria: theoretical foundation, sufficiency, clarity, coherence, quality, and relevance. The evaluation was systematized using Fleiss' Kappa concordance index, achieving a value of 1.0, representing "almost perfect agreement" among the evaluators. This information is summarized in Table 9, validating the quality of the proposed instrument for diagnosing the integration of ICT in higher education contexts.

**Table 9**

*Summary of values obtained from Fleiss' Kappa coefficient*

| Evaluation Criteria | Rating | | | | | Total, General |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| Theoretical Foundation. | - | - | - | - | 5 | 5 |
| Sufficiency. | - | - | - | - | 5 | 5 |
| Clarity. | - | - | - | - | 5 | 5 |
| Coherence. | - | - | - | - | 5 | 5 |
| Quality. | - | - | - | - | 5 | 5 |
| Relevance. | - | - | - | - | 5 | 5 |
| Theoretical Foundation. | - | - | - | - | 5 | 5 |

| | | |
|---|---|---|
| **Po:** 1 | **Pe:** 2 | **Po-Pe:** 1 |
| **Theoretical Concordance at Random:** | 1 | |
| **KAPPA:** | 1 | |

| Median | Mode |
|---|---|
| 5 | 5 |

***Note.*** Data collected during the evaluation conducted by five experts.

## Conclusions

Four fundamental dimensions for the integration of Information and Communication Technologies (ICT) in the teaching-learning process in higher education were identified: (1) use and knowledge of ICT, (2) integration of technological resources in teaching practice, (3) teacher training and innovation in ICT, and (4) the ethical component in teaching.

Based on these dimensions, a diagnostic instrument titled "Integration of ICT in the Teaching and Learning Process in Higher Education" was constructed, which included 29 items distributed among five to eight per dimension. These items were evaluated using a Likert scale with three frequency levels: "always," "occasionally," and "never," integrating them into the corresponding theoretical construct.

The instrument was validated using Lawshe's model, which allowed for the analysis of the validity of the 29 items in relation to the overall construct. The evaluation was conducted by five experts specializing in ICT applied to higher education, resulting in the selection of 22 items deemed valid. Regarding the reliability of the questionnaire, it demonstrated a "strong correlation"; the Cronbach's Alpha coefficient was classified as "excellent," and Fleiss' Kappa coefficient indicated an "almost perfect" level of agreement in evaluating the criteria of theoretical foundation, sufficiency, clarity, coherence, quality, and relevance.

## References


Abbas, A., Hosseini, S., Martín Núñez, J. L., & Sastre-Merino, S. (2021). Emerging technologies in education for innovative pedagogies and competency development. *Australasian Journal of Educational Technology*, 37(5), 1-5. https://doi.org/10.14742/ajet.7680

Basantes, A. A., Casillas-Martín, S., Cabezas-González, M., Naranjo-Toro, M., & Guerra-Reyes, F. (2022). Standards of Teacher Digital Competence in Higher Education: A Systematic Literature Review. Sustainability, 14(21), 13983. https://doi.org/10.3390/su142113983

Caicedo, L. M., & Goyes, H. A. (2024). Fortalecimiento de las Practicas Pedagógicas Inclusivas en una Unidad Educativa Fiscomisional del cantón Esmeraldas Periodo lectivo 2024 [Pontificia Universidad Católica del Ecuador]. https://repositorio.puce.edu.ec/handle/123456789/44883

Castaño Niño, L. (2022). Las TIC como estrategia metodológica en el proceso de enseñanza-aprendizaje de las matemáticas en el grado noveno de la Institución Educativa Rufino José Cuervo Centro de Armenia-Quindío. https://repositorio.unicartagena.edu.co/entities/publication/ef4bb8cb-a09c-4e8d-b5c8-6ed17b28f6ea

Castell, M. (2000). Globalización, sociedad y política en la era de la Información. Bitácora Urbano-Territorial, 4(1), 42-53. Coello, G., y Alcívar, A. (2023). Impacto de las TICs en el proceso de enseñanza y aprendizaje [Dataset]. https://doi.org/10.23857/pc.v8i8.5978

Corona, L. A. M., & Fonseca, M. H. (2023). Las hipótesis en el proyecto de investigación: ¿cuándo si, cuándo no? The hypotheses in the research project: When yes, when no? Medisur, 21(1). http://scielo.sld.cu/scielo.php?pid=S1727-897X2023000100269&script=sci_arttext&tlng=pt

Cruz Pérez, M. A., Pozo Vinueza, M. A., Juca Aulestia, J. M., & Sánchez Ramírez, L. D. L. C. (2020). Integración de las TIC en el currículo desde la perspectiva de los investigadores que incurren en la temática. *Revista ciencias pedagógicas e innovación,* 8(1), 55-61. https://doi.org/10.26423/rcpi.v8i1.368

Di Michele, P. D., Gómez, A. H., Herrera, R. A., & Pulido, F. G. (2023). Evaluation of the Use of ICT Tools in Higher Education. En A. Mesquita, A. Abreu, J. V. Carvalho, & C. H. P. De Mello (Eds.), Perspectives and Trends in Education and Technology (Vol. 320, pp. 587-595). Springer Nature Singapore. https://doi.org/10.1007/978-981-19-6585-2_52

Espinosa Ríos, L. (2024). La importancia de la evaluación de resultados y su incidencia en la formulación del proyecto académico 2022-2026, en la Universidad Autónoma de Chiapas. [Universidad Autónoma de Chiapas]. http://148.222.11.200/jspui/bitstream/123456789/4200/1/11011031%20LILIANA%20ESPINOSA%20RIOS%20-%20LILIANA%20ESPINOSA%20RIOS.pdf

Espíritu, Y., Barrantes, F., & Siguas, P. (2022). La integración de las TIC en la educación superior: aprendizajes a partir del contexto covid-19. *Ciencia Latina Revista Científica Multidisciplinar*, 6(2), 4260-4277. https://doi.org/10.37811/cl_rcm.v6i2.2162

Islas Torres, C. (2018). La implicación de las TIC en la educación: Alcances, Limitaciones y Prospectiva / The role of ICT in education: Applications, Limitations, and Future Trends. RIDE *Revista Iberoamericana para la Investigación y el Desarrollo Educativo*, 8(15), 861-876. https://doi.org/10.23913/ride.v8i15.324

Jiménez López, L. D. (2024). DISEÑO DE LOS SERVICIOS DEL LABORATORIO DE LÁMINAS DELGADAS DEL DEPARTAMENTO DE GEOLOGÍA DE LA ESCUELA POLITÉCNICA NACIONAL [Trabajo de Integración Curricular, Escuela Politécnica Nacional]. http://bibdigital.epn.edu.ec/handle/15000/25896

Kumar, S. & Priyanka. (2023). The Effects of Information and Communication Technology (ICT) on Pedagogy and Student Learning Outcome in Higher Education. ICST Transactions on Scalable Information Systems. https://doi.org/10.4108/eetsis.4629

Montero Zamora, E. G., Segura Cueva, K. A., Montero Cadena, O. G., & Montero Cadena, S. B. (2024). Evaluación de la validez y fiabilidad en estudios científicos: Revisión sistemática de métodos y buenas prácticas. https://doi.org/10.5281/ZENODO.14207509

Raza, S. A., Qazi, W., Khan, K. A., & Salam, J. (2021). Social Isolation and Acceptance of the Learning Management System (LMS) in the time of COVID-19 Pandemic: An Expansion of the UTAUT Model. Journal of Educational Computing Research, 59(2), 183-208. https://doi.org/10.1177/0735633120960421

Solano, E. H. (2023). ESTRATEGIA METODOLÓGICA PARA LA INTEGRACIÓN DE LAS TIC EN LOS PROCESOS DE ENSEÑANZA-APRENDIZAJE POR PARTE DE DOCENTES DE LA EDUCACIÓN SUPERIOR COLOMBIANA. https://dialnet.unirioja.es/servlet/tesis?codigo=316695

UNESCO. (2021). Políticas de tecnologías de la información y comunicación (TIC) en educación_ estudios sobre políticas educativas en América Latina.

UNESCO. (2023). El papel de las tecnologías digitales en los aprendizajes del siglo XXI. https://unesdoc.unesco.org/ark:/48223/pf0000386981

Vizcaíno Zúñiga, P. I., Cedeño Cedeño, R. J., & Maldonado Palacios, I. A. (2023). Metodología de la investigación científica: Guía práctica. *Ciencia Latina Revista Científica Multidisciplinar*, 7(4), 9723-9762. https://doi.org/10.37811/cl_rcm.v7i4.7658