# INNOVATION AND DIGITAL COMPETENCES IN LATIN AMERICAN UNIVERSITIES

# INOVAÇÃO E COMPETÊNCIAS DIGITAIS NAS UNIVERSIDADES LATINO-AMERICANAS

# INNOVACIÓN Y COMPETENCIAS DIGITALES EN UNIVERSIDADES LATINOAMERICANAS

## Zlata Borsic-Laborde[1], María del Carmen Gutiérrez-Diez[2], Augusto Cabrera-Duffaut[3]

## ABSTRACT

The objective of the study was to analyze the influence of innovation in the development of digital competences of university students in two Latin American universities, one in Mexico and the other in Ecuador. To do this, a descriptive research was carried out, whose research subjects were a sample of students from all levels of administrative careers from the participating universities. The research instrument was applied in April 2025 and it consisted of a questionnaire from the UNAM called TICómetro, where the results reflect that the levels of digital skills are independent of the level of access to technological means.

**Keywords:** Innovation. Digital Skills. Information. Communication Technologies.

## RESUMO

O objetivo do estudo foi analisar a influência da inovação no desenvolvimento de competências digitais de estudantes universitários de duas universidades latino-americanas, uma no México e outra no Equador. Para isso, foi realizada uma pesquisa descritiva, cujos sujeitos da pesquisa foram uma amostra de estudantes de todos os níveis de carreira administrativa das universidades participantes. O instrumento de pesquisa foi aplicado em abril de 2025 e consistiu em um questionário da UNAM denominado TICómetro, onde os resultados refletem que os níveis de habilidades digitais são independentes do nível de acesso aos meios tecnológicos.

**Palavras-chave:** Inovação. Competências Digitais. Informação. Tecnologias de Comunicação.

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[1]Doctor of Administrative Sciences. Universidad Nacional Autónoma de México (UNAM). Universidad de las Fuerzas Armadas (ESPE). E-mail: zdborsic@espe.edu.ec
ORCID: https://orcid.org/0000-0001-8145-2313 Lattes: https://lattes.cnpq.br/6068396881515471
[2] Doctor of Administrative Sciences. Universidad Nacional Autónoma de México (UNAM). Universidad de Chihuahua. E-mail: cgutierr@uach.mx  ORCID: https://orcid.org/ 0000-0001-9159-3283
Lattes: https://lattes.cnpq.br/7633482289715676
[3] Master in Information Systems Management. Universidad de Cuenca. E-mail: acabrerad@ucacue.edu.ec
ORCID: https://orcid.org/0000-0001-5322-5228 Lattes: http://lattes.cnpq.br/1873078345560577

## RESUMEN

El objetivo del estudio fue analizar la influencia de la innovación en el desarrollo de las competencias digitales de estudiantes universitarios en dos universidades latinoamericanas, una de México y la otra de Ecuador. Para ello, se realizó una investigación descriptiva, cuyos sujetos de investigación fueron una muestra de estudiantes de todos los niveles de las carreras administrativas de las universidades participantes. El instrumento de investigación se aplicó en abril del 2025 y consistió en un cuestionario de la UNAM denominado TICómetro, donde Los resultados reflejan que los niveles de habilidades digitales son independientes del nivel de acceso a los medios tecnológicos.

**Palabras clave:** Innovación. Competencias Digitales. Tecnologías de la Información. Comunicación.

# 1 INTRODUCTION

In the current context of rapid technological evolution, the need for citizens to develop digital skills is imperative for their performance in academic and professional life. Digital competence is defined as the set of knowledge, skills, abilities and skills essential to interact effectively with the digital environment and build knowledge. Therefore, in today's rapidly digital transformation landscape, it is imperative that individuals develop strong digital competencies to function successfully in the academic and professional fields. (Fundación Fepropaz, 2023)therefore, it is required that in their professional development digital literacy processes are generated that involve the management and secure use of information, as well as the acquisition of skills in the proper handling of computers and technological devices.(Fundación Fepropaz, 2023)

In this sense, the authors García-Quismondo and Cruz-Palacios (2018), state that digital competences are an educational instrument that allow citizens to participate in most aspects of twenty-first century society, such as employability, politics, and a number of situations of social and cultural interaction, digital competence being understood as a group of digital knowledge, skills, abilities and skills that interact by virtue of a series of personal attributes of the individual,  to respond adequately to the different demands of the environment and build knowledge.

Similarly, Iglesias et al. point out that digital skills are the most measurable and practical products of training developments in relation to new technological education, so, in this context, a publication by the European Union's Science and Knowledge Service groups digital competences into five categories,  such as: information, communication and collaboration, content creation, security and problem solving, these categories group together a total of 21 skills that all individuals must have on the call (2023)*Knowledge society* (Vuorikari et al., 2016).

Within this framework, the DigComp model, developed by the European Commission, stands as an essential reference tool for the definition, evaluation and development of these competencies, serving as a basis for educational curricula and public policies, as is the case of the study based on the model *DigComp*of González et al (2018), in which they evaluated the digital competencies of several university students and obtained as a result the level that they believe they have with respect to their digital skills, however, the authors express the need to have an instrument that evaluates the competencies of students in a quantitative way, which would allow verifying the real level of digital knowledge of students (González et al., 2018).

In response to this identified need, researchers from the National Autonomous University of Mexico – UNAM, developed a simulator-type measurement instrument called *TICometer*, in which the student is tested by evaluating their digital skills, this instrument is framed in dimensions similar to that of the model *DigiComp*, being that, in this new instrument, four issues related to the use of ICTs are evaluated, which are: a) search, selection and validation of information, b) online communication and collaboration, c) processing and management of information and d) security*.* As a result of the reliability tests of the instrument in question, it has been identified that, although most young people interact daily with technology or digital devices, this does not often imply that they have a good academic level in terms of the use and management of their digital skills. (Laxague, M.; Zamora, I.; Coordinación de Tecnologías para la Educación, DGTIC, UNAM, 2012).

## 1.1 STATEMENT OF THE RESEARCH PROBLEM

The objective of this study is to identify the real situation regarding the level of digital skills that students really have; therefore, the study was applied in two organizations dedicated to higher education, the Autonomous University of Chihuahua in Mexico and the Catholic University of Cuenca in Ecuador. To this end, a survey validated in a previous study conducted by Sánchez-Rivas et al. was used; in addition, the results obtained between the two institutions participating in the study were compared, in order to identify the existence or not of discrepancies, taking into consideration that the University of Mexico is public and the University of Ecuador is private.(2020)

The research opportunity arises from the current rapid technological evolution, which prevails the need for individuals to develop digital competencies for their performance in academic and professional life. This situation motivated the preparation of this study to identify the real situation of the level of digital skills that students have. This led to the search for an appropriate technological solution, which in this case was the use of the *TICómetro,* a standardized and validated questionnaire, which automates the qualification and is based on a matrix of digital skills that integrates national and international standards. However, the present study has some limits, such as: a) technical aspects, because the research is based on the application of the *TICómetro,* b) geographical aspects, because the study was applied in two Latin American universities: the Autonomous University of Chihuahua (UDECH) in Mexico and the Catholic University of Cuenca (UCACUE) in Ecuador, c) population-based, since the research subjects were a sample of students at all levels of the administrative careers of the participating universities.

## 1.2 JUSTIFICATION

The topic may be of interest to other fellow researchers because it addresses the crucial need to develop digital skills in the current context of rapid technological evolution. The research seeks to identify the real level of digital skills that university students possess , which is a fundamental aspect for their academic and professional performance. In addition, the study uses a validated instrument, the *TICómetro*, which allows a quantitative assessment of digital skills , overcoming the need identified by other authors to have a tool that verifies the real level of digital knowledge. The comparative analysis between a public and a private university in different Latin American countries (Mexico and Ecuador) adds a valuable contextual dimension, exploring institutional, pedagogical or cultural factors that influence the development of these competencies.

This work would contribute to what is already known on the subject by providing a quantitative assessment of the real level of digital skills, unlike previous studies that were based on students' self-perception. It allows for the finalization of skill level independence and access to ICTs, a finding that suggests that everyday technological familiarity does not necessarily imply strong academic or professional digital literacy, which contradicts a common assumption and provides a critical perspective. In addition, it allows  for the comparison of diverse educational contexts since the study was applied in universities of different countries and types (public and private), an aspect little explored in depth in previous studies that often focus on unique contexts. Finally, the cross-sectional nature of the study and the collection of data from students are essential to generate a robust entry profile and support institutional decision-making regarding the integration of ICT in educational processes.

The lines of research that are developed are: a) the evaluation of digital competencies in university students, b) the relationship between access to ICT and the level of digital skill and the comparison of the level of digital competencies among students from different educational institutions.

The authors consider that it is relevant for the scientific community to carry out this research because it addresses a current imperative need, in the context of rapid technological evolution, the need to develop digital competencies is crucial for academic and professional performance. This research contributes to understanding how these competencies are being developed in the university environment, for this, a validated and quantitative assessment instrument such as the  *TICómetro* is used, which allows an objective assessment of digital skills, which responds to a limitation identified in previous studies that were based on self-perception, this strengthens the validity of the findings and offers a model for future research.

In addition, it provides comparative data between different educational contexts with valuable insights on how institutional, pedagogical or cultural factors can influence the development of digital competences, this is crucial to design more effective educational policies adapted to various realities.

## 1.3 PREVIOUS STUDIES

López-Gil and Sevillano (2020) they try to evidence the perception of university students about the development of digital skills outside formal educational contexts; These authors used two techniques to collect the information; in the first phase, a questionnaire was applied on the use of electronic devices, the self-perception of digital competence in each of the areas proposed by the National Institute of Educational Technologies and Teacher Training (INTEF), the competences that students consider they have developed in informal contexts, the training strategies in digital competence, the resources and tools they use, as well as the possibilities of articulating the use of competencies between formal and non-formal contexts. After the analysis of the results of the questionnaire, in a second phase, they carried out two discussion groups[4] with a total of 17 students. In the groups carried out, the results of the questionnaire were deepened, particularly in the ways in which digital competence is developed in informal contexts as well as the advantages and disadvantages of transferring these competences to the academic field, the results reflected that the participants spend a large part of their time in digital environments and for this they use both fixed and mobile electronic devices. however, these experiences are not homogeneous.

In another study, Sánchez-Caballé et al., sought to evaluate the level of development of digital competencies in 168 university students of the Faculty of Education and Pedagogy of the University of São Paulo. (2019)*Universitat Rovira i Virgili*; This research used as a research instrument a self-administered questionnaire called *INCOTIC*[5] (Gisbert et al., 2011) It consists of 104 items, and tries to answer how university students use, maintain expectations and attitudes and evaluate their level of digital competence. In the results obtained, it was evident that the average of the participants does not make a high use of ICTs, as well as the results showed a trend towards the use of mobile devices and laptops, in addition, it was identified that students have positive perceptions towards the use of ICTs.

In this order of ideas, Hernández-Sánchez et al. (2019)carried out a study on the digital training of digital university students, where they examined the level of digital competence of university students at the beginning of their training as future teachers; The

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[4] The discussion group is considered a useful technique in the study of subjects' perceptions, conceptions, attitudes, feelings, and practices regarding a topic (Gil, 1993).
[5] INCOTIC is a widely used instrument for self-perception of the digital competence of university students.

instrument used was *ad hoc* with additive Likert-type scales with 51 items that study the traits of digital competence through a four-factor factor analysis, with a pre-test-posttest evaluation model, the population used was 559 first-year students of Primary Education from the universities of Granada, Jaén and Oviedo.

The results of the study showed the great heterogeneity of the digital competence that university students have, and also allow us to affirm that there is a clear trend of digital students who present a performance that involves lower-order thinking skills, focused on storage, retrieval, presence and participation online and maintenance and protection. Meanwhile, higher-order skills related to evaluation and information management, filtering, creation and critical use, valuation of rights, and autonomy in problem solving are applied less frequently (Hernández-Sánchez et al., 2019).

In another study, authors Casillas et al., (2018)In their research focused on designing a questionnaire to measure the level of training in digital skills of university students, they developed a questionnaire with three dimensions: knowledge, device management, tools and attitudes towards ICTs, surveyed 656 students from the Faculty of Education of the University of Salamanca and the University of Porto. The most relevant results of the study reflected that the designed questionnaire was successfully adjusted to the proposed model by verifying an appropriate internal consistency, the number of factors per dimension is adequate, with which the authors conclude that it could be used as a useful instrument for future research.

In the same vein, Fernández et al. (2017) They carried out a study that sought to understand the perceptions of students about the digital skills they possess and about the role they play in the acquisition of them, higher education and the role of the teacher. The sample used was 327 students of the Degree in Social and Legal Sciences of the University of Malaga and students of Higher Education (CODAES). The results show that students mainly work on basic digital skills related to the search, production and processing of information, as well as communication and access to the virtual classroom, the most prominent perception is that the acquisition of digital skills is of vital importance for their studies and they are usually acquired autonomously.

Regarding the use of technological knowledge in organizations, the authors Fernández-Portillo et al. (2020)analyze in their study whether ICT innovation and the environment affect the increase in income through sales of SMEs, the research instrument used was a survey that was applied to 250 SMEs in the Spanish region of Extremadura.

Subsequently, they carried out a multivariate analysis based on structural equation models, with partial least squares, the most relevant contribution of the results suggests that

both the development of innovation and the use of ICT have a positive impact on the income of companies, therefore, both must be integrated as a fundamental part of their structure.

## 2 STUDY METHODOLOGY

To achieve the objective of the study, a quantitative, correlational research approach was adopted, designed to analyze the digital competencies of university students and identify the existence of significant relationships between the study groups. The digital skills of the participants were studied in crucial areas for the technological environment, such as the search, selection and validation of information; its processing and administration; online communication and collaboration; and digital security. The information was provided by a sample of students at all levels of administrative careers at participating universities in Mexico and Ecuador. These data were obtained in April 2025 by applying the *TICometer,* a standardized questionnaire developed by the National Autonomous University of Mexico (UNAM).(2020)

To this end, the *TICometer*, which automates qualification and is based on a digital skills matrix that integrates national and international standards. It consists of 30 questions randomly selected from a large bank and 10 additional items on access and habits of use of Information and Communication Technologies (ICT). It includes multiple-choice reagents, built-in drag-and-drop responses, and interactive web browsing simulators, spreadsheets, and word processors. The data analysis was carried out quantitatively, allowing the numerical evaluation of digital capabilities.  (Yadav, 2024)(UNAM, 2020)

The study is descriptive because it seeks to characterize the level of digital skills of students, while its cross-sectional nature implies that the data is collected at a specific time, offering a snapshot of the digital competencies of students at entry (Hernández-Sampieri et al., 2014). This approach is essential to generate a robust entry profile and to support institutional decision-making regarding the integration of ICT in educational processes.

It is necessary to highlight the definition of digital skills (Oliva et al., 2024), which focuses on the ability of individuals to solve problems using technological resources (hardware and software), communicate and manage information, this conception is framed in the concept of digital literacy, which implies the ability to access, evaluate, transform and communicate information through digital technologies (Zaldívar et al., 2025). Therefore, in this study, we seek to evaluate four main areas of digital skills, such as: a) search, selection and validation of information, b) processing and management of information, c) online communication and collaboration and d) security in the digital environment, .(UNAM, 2020)(Solórzano & Sacón, 2024)

By taking into consideration that practical skills are best demonstrated through concrete problem-solving, the *TICometer* allows simulating real situations of ICT use, thanks to the fact that it was built on the open source platform of Moodle, where its questionnaire module facilitates automating the qualification and making significant customizations, such as: the integration of answer options with images and interactive simulators of spreadsheet, word processor and internet browsing,  as well as obtaining basic statistical data  (UNAM, 2020)(Quintanar et al., 2022). This instrument consists of 30 questions that are randomly selected from a large bank of items and 10 additional items to collect data from students on access and habits of use of ICTs. The items are of three types: a) multiple-choice answers that can include text or images, b) constructed-response questions, such as dragging and dropping text or images to order procedures, c) interactive web browsing simulators, spreadsheets, and word processors, where students must complete specific tasks.

All items are scored automatically, which facilitates large-scale data collection and analysis, providing valuable information for institutional decision-making regarding the integration of ICT in education, teacher training, and technological infrastructure on university campuses (García & López,  2023). It should be noted that the results of the TICómetro are classified with a system of colored ribbons, where each color represents a different level of skill in the use of ICTs, in which the color white represents a basic level, the color orange is equivalent to a medium level, the color blue represents a high level and the color black is equivalent to a very high level of skill in the use of ICTs.

Based on the theory, the following scientific question arises: *Is the level of ability independent of access to ICTs?*

From this question the research hypotheses derive:

**H01 =** There is no relationship between the level of ability in the use of technology of the surveyed students and the means they use to access ICTs.

**Ha1:** There is a relationship between the level of ability in the use of technology of the surveyed students and the means they use to access ICTs.

**H02** = There is no significant difference in terms of central tendency in the level of ICT use between the surveyed students of UCACUE and UDECH.

**Ha2** = There is a significant difference in terms of central tendency in the level of ICT use between the surveyed students of UCACUE and UDECH.

## 3 RESULTS

Since the research was carried out in two universities in different Latin American countries, the results obtained in each of them and the respective comparison between both

institutions are presented. Regarding the gender of the respondents, the details are shown in Table 1.

**Table 1**

*Gender of the students at the universities participating in the study*

|  | UCACUE | | UDECH | |
| --- | --- | --- | --- | --- |
|  | Frequency | Percentage | Frequency | Percentage |
| Female | 170 | 59.9 | 22 | 32.4 |
| Male | 114 | 40.1 | 46 | 67.6 |

The TICómetro was applied to 284 students of two careers of the Catholic University of Cuenca (UCACUE), of which the majority (59.9%) correspond to the female gender. On the other hand, at the University of Chihuahua (UDECH), the research instrument was applied to 68 students since they were in academic recess, the results reflect that most of the respondents (67.6%) are male.

In relation to the way in which respondents from both universities access ICTs, the results are presented in Table 2.

**Table 2**

*Access to ICTs*

| Access Device | UCACUE | | UDECH | |
| --- | --- | --- | --- | --- |
|  | Frequency | Percentage | Frequency | Percentage |
| Desktop | 36 | 12.7 | 10 | 0.15 |
| Laptop | 235 | 82.7 | 55 | 0.81 |
| Tablet | 1 | 0.4 | 0 | 0 |
| Telephone | 12 | 4.2 | 3 | 0.04 |
| **Total** | **284** | **100** | **68** | **100** |

The majority (82.75%) of the surveyed UCACUE students indicated that they have access to ICT through a personal laptop, in second place (12.7%) they indicated that they access through a desktop computer, in third place (4.2%) they indicated that they access through a smartphone and finally (0.4%) the access is with a tablet. In this same question, the majority (80.9%) of UDECH students indicated that they have access to ICTs through a personal laptop, followed by the use of a desktop computer (14.7%) and finally (4.4%) indicated that they access with a smartphone.

Regarding the skill level of respondents from both universities, the details are shown in Table 3.

**Table 3**

*Skill Level*

|  | UCACUE | | UDECH | |
| --- | --- | --- | --- | --- |
|  | **Frequency** | **Percentage** | **Frequency** | **Percentage** |
| White Ribbon | 7 | 2.5 | 2 | 2.9 |
| Orange Ribbon | 161 | **56.7** | 8 | 11.8 |
| Blue Ribbon | 113 | 39.8 | 49 | **72.1** |
| Black Belt | 3 | 1.1 | 9 | 13.2 |
| **Total** | 284 | 100 | 68 | 100 |

The ribbons represent a range of grades, so that the results of the *TICómetro* applied to UCACUE students reflect that the majority (56.7%) of the respondents obtained the orange ribbon (medium level), followed (38.79%) by the respondents who obtained the blue ribbon (high level), in third place (2.46%) with the white ribbon (low level) and finally (1%) the black ribbon (very high level).

Similarly, the results obtained with UDECH students reflect that most of the respondents (72.06%) obtained a blue belt skill level (high level), in second place (13.24%) the students obtained a black belt (very high level), followed (11.76%) by the orange ribbon (medium level) and finally (2.94%) obtained the white belt (low level).

In response to the scientific question, the Chi-Square test was performed between the skill level and the means of access to ICTs. The details are presented in Table 4.

**Table 4**

*Skill Level Crossover * Access to ICT*

| University | Skill Level | ICT Access Device | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | PC | % | Laptop | % | Tablet | % | Telephone | % |
| UCACUE | White Ribbon | 0 | .Oo | 6 | .03 | 0 | .00 | 1 | .08 |
|  | Orange Ribbon | 18 | .50 | 134 | .57 | 1 | 1.00 | 8 | .67 |
|  | Blue Ribbon | 18 | .50 | 92 | .39 | 0 | .00 | 3 | .25 |
|  | Black Belt | 0 | .00 | 3 | .01 | 0 | .00 | 0 | .00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **UDECH** | White Ribbon | 0 | .Oo | 2 | .Oo | 0 | .00 | 0 | .00 |
| | Orange Ribbon | 2 | .20 | 6 | .10 | 0 | .00 | 0 | .00 |
| | Blue Ribbon | 8 | .80 | 38 | .70 | 0 | .00 | 3 | 1 |
| | Black Belt | 0 | .00 | 9 | .20 | 0 | .00 | 0 | .00 |

Note: Desktop = PC, Percentage = %.

When cross-referencing the level of skill and the device that respondents use to access ICTs, it was identified that, at UCACUE, the majority (67%) use a cell phone to access ICTs; on the other hand, at UDECH the majority (80%) of those surveyed access through a desktop computer.

In relation to the chi-square test, the UCACUE showed that there are no significant differences between the percentage of the level of technological skill and the means of access to ICT of the respondents ($\chi^2$ (9, N=284) = 6.077, $p$ = 0.732), in this case, the p-value (0.732) is higher than the level of significance (0.05). therefore, the null hypothesis is accepted and there is no evidence of a significant association, from which it is denoted that the level of technological skill of the surveyed students is not influenced by the means of access to ICTs. The chi-square results for the UDECH also reflect that the level of technological skill is independent of access to technological means, ($\chi^2$ (6, N=68) = 4.043, $p$ = 0.671), the p-value (0.671) is higher than the level of significance (0.05), therefore, the null hypothesis is accepted, which confirms that there is no evidence of a significant association between the variables.

On the other hand, the level of skills in the use of ICT was compared and it was possible to identify that UDECH students present the blue ribbon (high level) and the black belt (very high level) more frequently, while in the UCACUE it is evident that the predominant levels are those of the orange ribbon (medium level) and the blue ribbon (high level). the details are shown in Table 5.

**Table 5**

*Cross Table Level*University*

| Level of ICT use | University | | | | Totals by level | |
|---|---|---|---|---|---|---|
| | UCACUE | | UDECH | | | |
| White Ribbon | 7 | 0.025 | 2 | 0.029 | 9 | 0.026 |
| Orange Ribbon | 161 | 0.567 | 8 | 0.118 | 169 | 0.480 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Blue Ribbon | 113 | 0.398 | 49 | 0.721 | 162 | 0.460 |
| Black Belt | 3 | 0.011 | 9 | 0.132 | 12 | 0.034 |

Likewise, since the data do not meet the assumption of normality and because they are independent, the non-parametric *Mann-Whitney U* statistic was used to compare the scores of the level of knowledge in the use of ICT between the groups [UCACUE students] and [UDECH students], the details are shown in Table 6.

**Table 6**

*Test statistics*

| | Qualification |
|---|---|
| U de Mann-Whitney | 4038.000 |
| W for Wilcoxon | 44508.000 |
| Z | -7.455 |
| Asymptotic sig. (bilateral) | .000 |

Grouping variable: University

The results ($z$ = -7.455, $p <$ .05) show that the median grades obtained in the TICómetro by the surveyed students from both universities are different from each other, therefore, the null hypothesis is rejected and it is concluded that there is a statistically significant difference between the distributions of the two groups.

## 4 DISCUSSION

This research addresses the imperative need to develop digital competencies in the current university context. The results of this study, as well as previous findings, underscore the heterogeneity of the digital skills possessed by university students. Although young people interact with technology on a daily basis, this does not necessarily translate into a high academic level in the use and management of digital skills. This research confirms that the level of digital skills of university students is not directly related to the type of device or access to ICTs, a finding that coincides with the perspective of Laxague, Zamora and the Coordination of Technologies for Education, DGTIC, UNAM (2012).

The study reveals significant differences in the levels of digital competence between students at the Catholic University of Cuenca (UCACUE) in Ecuador and the Autonomous University of Chihuahua (UDECH) in Mexico, despite having used the same assessment instrument, the *TICómetro.* While in the UCACUE the medium (orange ribbon) and high (blue ribbon) levels predominate, in the UDECH the high (blue ribbon) and very high (black belt)

levels stand out. These findings suggest that institutional, pedagogical or cultural factors, beyond simple technological access, influence the development of these competencies. This difference is corroborated by the Mann-Whitney U test, which showed a statistically significant difference between the median grades obtained in the *TICómetro* by students from both universities.

Most students, both at UCACUE and UDECH, are at intermediate to high levels, but with a lower proportion at the more advanced levels (black belt). This indicates a clear opportunity to improve higher-order competencies, such as critical appraisal, content creation, and autonomous problem-solving. This point is consistent with what was raised by (Hernández-Sánchez et al., 2019), who pointed out that higher-order skills are applied less frequently. Therefore, it is imperative, as suggested by Oliva et al., (2024), to focus on the ability of individuals to solve problems using technological resources, communicate, and manage information.

Based on the results, the need to design pedagogical interventions focused on advanced digital competencies is reinforced, as well as to strengthen teaching capacities and institutional digital culture. This is in line with what has been pointed out by Iglesias et al., (2023)on the importance of digital skills as measurable products of training in relation to the new technological education. The integration of ICT in educational processes, teacher training, and technological infrastructure on university campuses becomes crucial, as they emphasize (García & López, 2023).

## 5 CONCLUSIONS

- **Access does not guarantee competence**, the study shows that the level of digital skills of university students is not directly related to the type of device or access to ICTs. This statistical independence suggests that everyday technological familiarity does not necessarily imply strong academic or professional digital literacy.

- **Significant differences between educational contexts**, despite using the same assessment instrument, statistically significant differences were found in the levels of digital competence between students from a Mexican public university (UDECH) and an Ecuadorian private university (UCACUE). This finding suggests that there are institutional, pedagogical or cultural factors that influence the development of these competencies, beyond simple technological access.

- **Predominance of basic and intermediate skills,** most of the students evaluated at UCACUE are located at the medium level (orange belt), while at UDECH the high and very high levels (blue and black belt) predominate. However, both contexts show a

lower proportion of students at the most advanced levels, indicating a clear opportunity for improvement in higher-order competencies (critical appraisal, content creation, autonomous problem solving).

## RECOMMENDATIONS

- **Designing pedagogical interventions focused on advanced digital competencies, it is recommended that universities implement curricular programs aimed at developing higher-order digital skills (such as** critical evaluation of information, management of complex data, or creation of digital content). This will allow students to move from the instrumental use of technology to the strategic and innovative use.
- **To reduce the training gap through inclusive policies, universities must promote affirmative actions to ensure that students from diverse socioeconomic, cultural and gender backgrounds have access to effective digital training processes. It is suggested to include differentiated content that attends to diversity and promotes equity, preventing digital literacy from reproducing existing inequalities.**
- **Strengthening teaching capacities and institutional digital culture to generate a truly innovative ecosystem, it is necessary to work not only with students, but also with teachers and institutional management. It is recommended to promote a culture of critical and ethical use of ICTs, which includes the prevention of digital violence, the protection of personal data and coexistence in virtual environments.**

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