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DIGITAL COMPETENCIES: KNOWLEDGE NEEDED TO DEVELOP RESEARCH SKILLS IN UNIVERSITY STUDENTS

Carlos Alberto Peña Miranda
https://orcid.org/0000-0002-4339-4615

Elizabeth Cosi Cruz
https://orcid.org/0000-0002-0255-7705

Rosario del Pilar de la Cruz Vila
https://orcid.org/0000-0001-5544-4475

Silvia Yanina Yaya Herrera
https://orcid.org/0000-0002-7925-0023

Abstract: Digital competencies have become one of the fundamental skills to achieve high standards in student learning, since they promote the development of research skills that allow access to knowledge. Thus, the objective of this research was to determine the influence of digital competencies on research skills in a sample of university students from a private university in Lima, Peru. The method used was descriptive, with a quantitative approach, with a basic research type and a non-experimental and cross-sectional design. The sample consisted of 250 students, to whom two questionnaires were administered. The data were analyzed using a structural equation model, through which the incidence was tested. In addition, the correlations between the dimensions proved to be positive and significant. These results made it possible to establish the importance of digital competencies in the development of research skills, so universities should consider as one of their main objectives to develop programs aimed at improving these competencies and skills.
Keywords: research skills; digital competencies; learning, knowledge.

INTRODUCTION

The irruption of Information and Communication Technologies (ICT) and their accelerated development, as well as their early adoption and massification, have caused a significant transformation in the ways of life of human beings. This can be observed in behavior, thought, as well as in the systems of social interaction, labor relations, among others. These changes have become evident especially among children and young people, for whom the use of ICTs has become a fundamental part of their lives because it is through them that they get in touch with what is happening in the world, allowing them to easily access knowledge and all kinds of information that is put on the network (Martín, 2016; Iordache et al., 2017).

These great changes have also reached the educational world, where these children and young people use them to search for information, review and research for the development of their academic duties, among others. Thus, to facilitate the process of knowledge construction and cognitive processes such as critical thinking of students, it is necessary that both they and their teachers, are in possession of digital skills, which can be understood as a set of skills and abilities that allow them to make use of new technologies. In such a way, that their information exchange processes are facilitated, and learning can flow more easily (Gozálvez et al., 2014; Palacios, 2021; Chanto & Mora, 2021).

Despite the efforts made to bring the use of ICTs closer to the majority of the population and to teach their management, there is no evidence of great progress, mainly due to the difficulties presented by the digital divide (Rodríguez, 2011; Marzal & Cruz-Palacios, 2018). This is a multidimensional and continuously evolving concept that refers to the difference in the relationship between different social groups and technology (Arango-Lopera et al., 2022). Applied to education, it can be understood as the difference in access and disparate management that older teachers have compared to younger students. But even among the latter there are differences, since knowing ICT does not necessarily mean that they know how to use them for research and study (Carneiro, et al., 2021). In Peru, the COVID-19 pandemic made it clear that, although the percentage of the population with access to ICTs is quite high; however, the migration to emergency remote education did not produce the expected academic results, since many teachers and students were not trained to use them appropriately in the educational setting (Chanto & Mora, 2021).

Ensuring that students are in possession of the digital competencies necessary to facilitate access to and use of knowledge is essential for them to be trained as autonomous, independent learners, and with significant levels of critical thinking (Martín, 2016; Iordache et al., 2017). In other words, a university student with a solid competence presents a better understanding and interpretation of reality. In this way, he or she can be prepared to face the changes and challenges brought by the digital transformation. These are the reasons why it is necessary for students to master these skills, integrating themselves into the research processes that are developed at the university, as well as the assignment of research tasks or the development of projects which will have a direct effect on their professional training, thus becoming an essential element that must always be had and as a fundamental part of the training of new professionals (Estrada et al., 2022).

DIGITAL COMPETENCIES

For several years, various definitions of digital competence have been developed. And this impacted with greater emphasis during the pandemic, since problems in the educational system were evidenced. According to Marzal & Cruz-Palacios (2018) refer that Information and Communication Technologies (ICT) is the critical use of information through information literacy in a safe way, in other words, that solutions can be given to problems in the academic, professional aspect, among others. In the same sense, after pandemic Monroy & Chuye (2024) indicate that digital competences consist in the appropriate and critical use, i.e., not only should information be sought, but also how to use and how to apply it for the development of various problems.

RESEARCH SKILLS

Research skills are the result of a set of interrelated dimensions that correspond to higher functions of thought. These skills develop as the person acquires, improves and perfects his or her abilities, giving rise to interdisciplinary cognitive processes. As a consequence, the individual not only receives information from the environment, but also assimilates, transforms and adapts it, allowing him/her to acquire and apply knowledge in a more efficient and flexible manner (Barbachán, et al., 2020).

The need to develop research skills among students has led universities in general to incorporate as mandatory courses related to research, which allow future professionals to develop skills aimed at collecting and interpreting data, as well as the necessary knowledge to be able to perform the respective analysis and to be able to support the conclusions and recommendations that can become true reflections when it comes to social and scientific aspects. Therefore, the formation of research skills in future professionals is important, since it allows them to identify any type of need that exists in the place where they will work so that they can design the corresponding actions and put them into practice (Barbachán, et al., 2020; Casimiro et al., 2020; Díaz & Cardoza, 2021).

Thus, the present article aims to determine the influence of digital competencies on research skills in a sample of university students from a private university in Lima, Peru.

METHODOLOGY

The present research employed a descriptive method, with a quantitative approach, the research is of a basic type and a non-experimental and cross-sectional design was used, to the extent that data collection was carried out at a single point in time. The study is of an explanatory nature, its objective is to determine the influence of digital competencies on research skills. A Structural Equation Model (SEM) was used which allows the analysis of the relationships between latent variables (unobservable variables) that represent theoretical concepts and data collected through indicators (Hair et al., 2017).

The study was carried out with students in the first two academic years of the engineering program at a private university in the city of Lima, Peru. The total number of the population is 250, so we worked with all of them, and the sample was selected by convenience. Of these, 62.8% were males and 37.2% were females, aged between 17 and 25 years, with the majority being 18 years old (18.4% of the sample).

All students in the sample were administered the two data collection instruments. The Mengual digital competencies inventory was used to measure the variable of the same name. It is composed of five dimensions: technological literacy, access to and use of information, communication and collaboration, digital citizenship, and creativity and innovation. The Campos Céspedes research skills questionnaire was used to measure research skills. This variable is composed of five other dimensions: cognitive skills, technological skills, methodological skills, research management skills, and teamwork skills. Both instruments were subjected to the respective statistical analyses, which confirmed their validity and reliability. The data collected were analyzed using the R-based software Jamovi 2.53.

RESULTS

The preliminary analysis of the model including the 5 endogenous variables (the five dimensions of research skills) suggested the exclusion of the teamwork skills variable, because it reached low values in the proposed model. Using the remaining 4 dimensions, correlations with the 5 dimensions of digital competencies were estimated. The results, expressed in Table 1, indicate positive correlations, greater than $r = .40$, $p < .001$, in all cases, which can be classified as moderate to high. Of note are the correlations between cognitive skills and creativity and innovation ($r = .78$), and cognitive skills and technological literacy ($r = .75$). In addition, all correlations for research management skills are moderate.

	AlfD	AccU	Comu	Ciud	Create
H. Cognitive	0.751	0.721	0.746	0.715	0.779
H. Technological	0.744	0.684	0.716	0.674	0.745
H. Methodological	0.623	0.584	0.600	0.553	0.610
H. Manage research	0.498	0.440	0.440	0.419	0.471

Table 1 - Correlation matrix between variables

Note: AlfD = technological literacy; AccU = access and use of information; Comu = communication and collaboration; Ciud = digital citizenship; Crea = creativity and innovation.

Reliability analysis through Cronbach's Alpha (α) and MacDonald's Omega (ω) coefficients, as well as the average variance extracted (AVE) as an indicator of the degree of representation of the construct, indicates that the sample allows achieving reliable scores and the latent variables calculated adequately represent the constructs evaluated. The results can be seen in Table 2.

Latent Variables	α	ω	AVE
Digital competencies	0.988	0.988	0.942
Research Skills	0.899	0.904	0.703

Table 2 - Reliability and Average Variance Extracted (AVE)

The Maximum Likelihood (ML) estimator was applied for the development of the study's calculations. The structural equation model examined the influence of the latent variable digital competencies on research skills and its indicators. Parameter estimation yielded statistically significant data. Factor loadings yielded an adequate fit of the data ($\chi 2/gl = 5.78$, $p < .001$; NFI = .946; CFI = .955; RMSEA = .06, 95% CI (.01 - .15).

When analyzing the standardized regression coefficients, we observe the existence of a positive and statistically significant effect of Digital Competencies on Investigative Skills (β=.77; $p<.05$). The model explains 51.20% of the variance of the Investigative Skills.

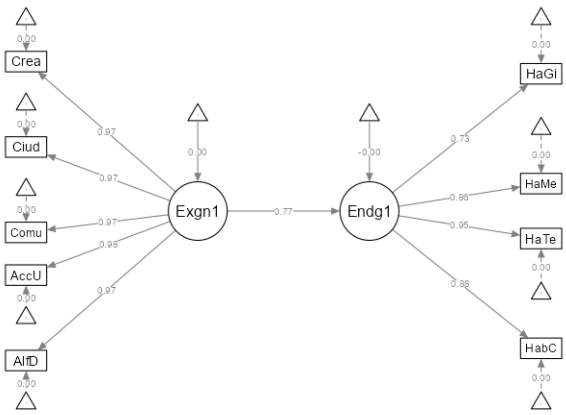

Figure 1 - Model of the influence of Digital Competencies on Research Skills

Note: Exogenous variable (Exgn1) = digital skills; Endogenous variable (Endg1) = research skills; AlfD = technological literacy; AccU = information access and use; Comu = communication and collaboration; Ciud = digital citizenship; Crea = creativity and innovation; HabC = cognitive skills; HaTe = technological skills; HaMe = methodological skills; HaGi = research management skills.

DISCUSSION

The results show that digital competencies have an influence on research skills in this sample of university students. This is in line with the proposals of authors such as Chanto & Mora (2021), and Iordache et al. (2017). They posit that, in a society that is becoming increasingly digitized, the correct use of ICTs is essential to insert oneself correctly in any of its fields, including education and research. In fact, as shown in Table 1, the technological literacy and creativity and innovation dimensions of the digital competencies variable have the highest correlation values, with values that are particularly high with cognitive and technological skills. The relevance of the cognitive component reaffirms the findings of Palacios (2021).

Along these lines, the management of digital competencies is fundamental for the development of research skills. These can enable efficient management of the growing amount of information available, resulting in higher quality research, with a potential positive impact on their education and academic-professional development (Marzal & Cruz-Palacios, 2018).

The moderate correlations of the research management dimension with all dimensions of digital competencies correlate with what was found in Peruvian universities by Casimiro et al. (2020) and Díaz & Cardoza (2021). These authors found that students' research skills are mostly moderate or low.

The objective of this research was to determine the influence of digital competencies on research skills in a sample of university students. The results of the SEM model described in the previous section confirm the main hypothesis of the research. In addition, it was found that all dimensions are correlated with each other, with particular incidence of technological literacy and creativity and innovation.

In view of the results obtained; on the one hand, it is possible to suggest that universities, both Peruvian and Latin American, design development plans and training in digital skills for both students and teachers. Thus, the creativity of students coupled with higher levels of technological literacy can make the influence of digital skills on research skills even greater, and thus raise the quality of research in the country. On the other hand, the research management dimension shows only moderate correlation values; it is necessary to develop programs to improve its levels. This is an important opportunity for both students and teachers to develop capacities for handling large volumes of information using technological tools.

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