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Workshop on Digital Competencies to Improve Research Skills in University Students

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Abstract

This report was addressed with the objective of determining how the digital skills workshop improves research skills in students university, from which the methodology was carried out under a quantitative approach according to the positivist perspective and under the experimental designs, classified as quasi-experimental, in which university students participated, with 34 students divided into two groups: 17 who formed the control group and 17 the experimental group. Regarding the descriptive results, differences were observed in the post-test and pre-test evaluations, in the levels of investigative skills that favored students in the experimental group; in comparison with those students in the control group where no substantial changes were evident. In addition, significant differences were reported in the means, which benefit the post test ($M = 22.94$) compared to the pre test ($M = 17.41$) in students of the experimental group, significantly due to $Sig. < 0.05$, which led to conclude that the digital skills workshop improves investigative skills in the analyzed sample significantly.

Keywords: Literacy, Digital Competence, Skill, Research

Introduction

Research skills, as well as digital competencies, are two key topics of recent times. The world's leading organizations have pointed out that it is not possible to predict with certainty which competencies or skills will be more fundamental than others, however, they have stressed the need to master essential skills for the present 21st century, highlighting digital skills, social communication skills and others such as research skills (Morduchowicz, 2021) . Such references were also discussed at the World Skills Summit 2022, which pointed out the implementation of programs or methodologies with the intention that students in training can acquire and develop skills for the present and future , in order to provide capabilities that can be used in the different areas that require it (Organization for Economic Cooperation and Development [OECD], 2022).

The use of ICTs plays a key role in strengthening research skills. ICTs provide people with access to a variety of resources, such as information sources, applications, tools, databases and other resources. In this sense, the mastery of competencies in the use of ICTs becomes crucial to take full advantage of these opportunities (Hidalgo et al., 2023) .

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There are several studies in which it was evidenced that university students in thesis courses, present difficulties in the presentation of academic papers, monographs, theses, articles, for not possessing sufficient research skills (Ipanaqué et al., 2023) . Similarly, it has been reported that in many cases, students do not know how to locate relevant information, do not have the skills to manage information and above all, the knowledge and expertise in the use of digital tools (Rueda et al., 2022) .

Under these considerations, the question was posed: Does the digital competencies workshop significantly improve research skills in university students?

Digital competencies, as such, are the set of skills, knowledge and attitudes necessary for the effective use of information technologies in various academic and other activities. For example, these skills can be applied to online communication and collaboration, information search and evaluation, problem solving, digital content creation and online safety (Tsankov and Damyanov, 2019) . One of the main theories in the digital context is the theory of connectivism, also known as a theory of digital learning, and was developed by Siemens, who remarked that digital activities are based on the interaction of people using digital resources through networks that are interconnected, Thus, connectivism states that the information that one accesses or manages is linked through connected networks, to which other users access to locate or exchange information that is stored in a large database (Cárdenas et al., 2023) .

According to DigComp version 2.2, digital competencies are understood from the following domains: search, information and data management, which is the ability to search for information in diverse sources; communication and collaboration, which is the ability of individuals to communicate, interact, share and collaborate using technological tools and resources; digital content creation, which refers to the ability of individuals to elaborate and develop content in digital format using information technologies; security, which is the ability to use information technologies in a safe and responsible manner; and, problem solving, which is the ability to use information technologies in a safe and responsible manner; and, problem solving, which is the ability of individuals to communicate, interact, share and collaborate using technological tools and resources; security, which is the ability to use information technologies in a safe and responsible manner; and, problem solving, which is the ability of individuals to identify, analyze and solve problems or difficult situations that may arise in the use of information technologies (Santos, 2023) .

the other hand, research skills are the set of qualities for the systematic development of research activities that range from problem-solving to the search for solutions using skills to observe, describe, analyze, synthesize and interpret (Dávila et al. 2022).

For the purpose of this inquiry, the dimensions were: identifying problems. Ability to recognize and define the research topic; information search, which is the ability to locate information related to the variables of interest; information processing, which is the ability to examine and interpret the information, aided by the use of technologies, techniques and statistical procedures; and communicating results, which refers to the ability to use both oral and written communication resources, in addition to using the necessary means to disseminate the findings or results of a research (Casanova et al., 2022) .

The objective of the present research was to determine how the digital competencies workshop improves research skills in university students.

Materials and Methods

The present research was developed fundamentally according to the quantitative approach, since it allowed the use of statistical methods to test assumptions that were formulated to ratify that a digital competencies workshop favors the development of research skills in students (Galeano, 2020). The epistemological basis of this approach is based on positivism, which considers that the reality under investigation can be known objectively (Naupas et al., 2023).

In relation to the type of study, it was of the applied type, considering the nature of the research whose practical purpose was to improve the students' research skills through a workshop (Zapata and Lombana, 2023)

In coherence with the objective, the assumed design was quasi-experimental, characterized by the use of two groups, one control and the other experimental, and it was in the latter that the workshop (Iglesias, 2021) was applied.

The method used was hypothetico-deductive, which starts from a hypothesis, which is inferred in advance using existing theories or empirical information. From this hypothesis, logical rules of deduction are applied to reach conclusions or empirical predictions. The objective is to establish a correspondence between the inferences made and their scientific verification (García, 2022).

Regarding the population, students enrolled in a research seminar course were considered and a total of 34 university students were selected, who were divided into two groups of equal size. In relation to the sample, it was integrated by the totality of the population, being its non-probabilistic sampling, adopted because the way to select the sample (Iglesias, 2021).

Results

Descriptive level

	Pre test				Post test			
	GC		GE		GC		GE	
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%
Under	4	23,5	6	35,3	4	23,5	0	0,0
Regular	13	76,5	9	52,9	10	58,8	8	47,1
High	0	0,0	2	11,8	3	17,6	9	52,9
Total	17	100,0	17	100,0	17	100,0	17	100,0

Table 1: Level of research skills

Note. *f*=Absolute frequency; GC = control group; EG = experimental group.

As shown in Table 1, in the pre-test, 76.5% of CG students showed regular research skills, 23.5% showed low skills. Similarly, it is observed that 52.9% of CG students showed a regular level, 35.3% a low level and 11.8% a high level.

In the post-test, it was observed that 58.8% of CG students showed a regular level of research skills, 23.5% showed a low level and 17.6% showed a high level. Likewise, 52.9% of the students of the GE showed a high level of research skills and 47.1% showed a regular level. The data show an improvement of scores in the experimental group, with differences that demonstrate that

the students who received the workshop improved their skills, reaching the highest level in a superlative percentage.

	Levels	Pre test (%)		Post test (%)	
		GC	GE	GC	GE
D1. Identify problems	Under	35,3	23,5	5,9	0,0
	Regular	41,2	52,9	70,6	35,3
	High	23,5	23,5	23,5	64,7
D2. Search for information	Under	11,8	29,4	11,8	0,0
	Regular	76,5	52,9	64,7	41,2
	High	11,8	17,6	23,5	58,8
D3. Process information	Under	29,4	29,4	23,5	0,0
	Regular	64,7	52,9	52,9	52,9
	High	5,9	17,6	23,5	47,1
D4. Communicate results	Under	29,4	17,6	35,3	11,8
	Regular	47,1	64,7	29,4	35,3
	High	23,5	17,6	35,3	52,9
	Total	100,0	100,0	100,0	100,0

Table 2: Levels of research skills per level

Note. f=Absolute frequency

In the abilities to identify problems, the CG showed 41.2% of students in the regular level, 35.3% in the low level and 23.5% in the high level in the pretest. In contrast, GE showed 52.9% at the regular level, 23.5% at the low level and 23.5% at the high level. In the post-test, GC decreased to 5.9% in the low, but GE reached 64.7% in the high level, evidencing a significant development in this ability after the intervention, which led GE to completely eliminate the low levels.

Regarding information seeking ability, the pretest showed that the CG had 76.5% at the regular level, while the SG reported 52.9% in this category. However, in the posttest, both groups improved, with the CG at 23.5% and the SG at 58.8% in the high, indicating that the intervention resulted in a considerable increase in the SG's ability to effectively search for information by completely eliminating the low level.

In the information processing dimension, the CG presented 64.9% as regular, 29.4% as low and 5.9% high on the pretest, while the GE showed 52.9% at a regular level, 29.4% at a low level and 17.6% at high. Despite the higher numbers of lows, both groups performed evenly at regular and high levels on the post test, with the CG at 52.9% and the GE maintaining a balance in levels. This suggests that, although there were improvements at the high levels, processing skills developed more evenly between the groups.

Finally, in the dimension of skills to communicate results, the control group in the pretest had 47.1% in the low level, in contrast to 17.6% of the experimental group. However, after the intervention, the SG achieved a remarkable 52.9% at the high level, while the CG only achieved 35.3%. This transformation highlights the success of the intervention in the experimental group, which improved its ability to communicate results.

Results at the inferential level.**Hypothesis testing**

H₀: The digital competencies workshop does not improve research skills such as identifying problems, searching for information, processing information, and communicating results in students of a public university in Chosica, 2024.

H_a: The digital competencies workshop improves research skills such as identifying problems, searching for information, processing information and communicating results in students of a public university in Chosica, 2024.

Table 3: Effects of the digital skills workshop to improve research skills in undergraduate students in the experimental group (EG) sample and effects of an alternative program in the control group (CG).								
Group	Dimensions/variable	Pre test - Average	-	Post - media	W	z	p	Rank-Biserial Correlation
GE	Identify problems	13.471	-	17.882	0.000	-3.296	0.001	-1.000
	Search for information	13.706	-	17.235	13.000	-2.844	0.005	-0.809
	Information processing	13.529	-	17.235	14.500	-2.766	0.006	-0.787
	Communicating results	14.706	-	18.235	11.000	-2.947	0.003	-0.838
	General research skills	55.412	-	70.588	3.500	-3.335	<.001	-0.949
GC	Identify problems	13.588	-	15.765	38.000	-1.823	0.07	-0.503
	Search for information	14.588	-	14.588	47.000	0.105	0.944	0.033
	Information processing	13.824	-	14	50.000	-0.157	0.899	-0.048
	Communicating results	14.706	-	13.941	81.000	1.789	0.076	0.543
	General research skills	56.706	-	58.294	45.000	-1.189	0.244	-0.338

Note. W=Wilcoxon for paired samples, EG= Experimental group; CG= Control group.

The results of the analysis using the Wilcoxon test for paired samples show significant differences in the experimental group (EG), evidencing the positive impact of the digital competencies workshop on the development of research skills. In particular, significant increases were found in all the dimensions evaluated, with effect sizes indicated by the rank biserial correlation. The *Identify problems* dimension showed a significant improvement (W = 0.000, z

= -3.296, $p = 0.001$), with a very large effect size ($R = -1.000$). Similarly, significant increases were found in *Seeking information* ($W = 13.000$, $z = -2.844$, $p = 0.005$, $R = -0.809$) and *Processing information* ($W = 14.500$, $z = -2.766$, $p = 0.006$, $R = -0.787$), both with large effect sizes. In addition, *Communicating results* presented a significant improvement ($W = 11,000$, $z = -2.947$, $p = 0.003$), with an effect size also large ($R = -0.838$). Finally, the *General Investigative Skills* total score showed a significant increase ($W = 3.500$, $z = -3.335$, $p < 0.001$), with a very large effect size ($R = -0.949$).

In contrast, the results of the control group (CG), which received an alternative program, did not reflect significant improvements in most of the dimensions evaluated. Although the dimension *Identify problems* showed an increase close to statistical significance ($W = 38.000$, $z = -1.823$, $p = 0.07$), the effect size was moderate ($R = -0.503$). In the other dimensions, no significant changes were observed: *Seeking information* ($W = 47,000$, $z = 0.105$, $p = 0.944$, $R = 0.033$), *Processing information* ($W = 50,000$, $z = -0.157$, $p = 0.899$, $R = -0.048$) and *General research skills* ($W = 45,000$, $z = -1.189$, $p = 0.244$, $R = -0.338$) presented small or negligible effect sizes. In *Communicating results*, a slight reduction in the posttest score was observed, although without reaching statistical significance ($W = 81,000$, $z = 1.789$, $p = 0.076$), with a moderate effect size ($R = 0.543$).

These results indicate that the digital competencies workshop implemented in the SG had a significant impact on the improvement of research skills, with effect sizes ranging from large to very large in all the dimensions evaluated. In contrast, the alternative program implemented in the CG did not generate significant changes, with small to moderate effect sizes. According to the recommendations for the interpretation of the rank biserial correlation, absolute values greater than 0.80 represent a very large effect size, between 0.50 and 0.80 indicate a large effect size, between 0.30 and 0.50 reflect a moderate effect, and values less than 0.30 correspond to small effects (Fritz, Morris & Richler, 2012). The consistency of the results in the experimental group suggests that the development of digital competencies can be an effective strategy to strengthen research skills in university students, representing a relevant intervention in the educational field.

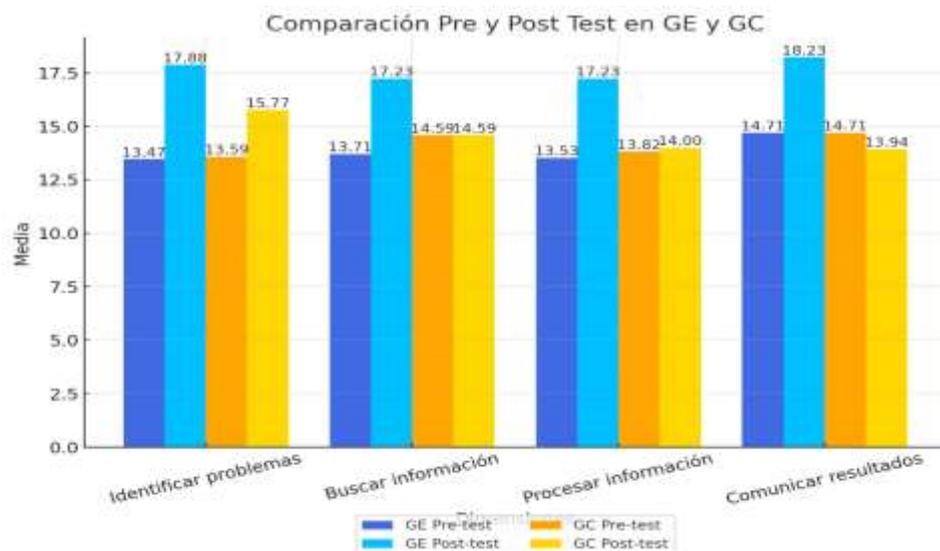


Figure 1: Comparison of GE and CG means of the research skills dimensions.

Figure 1 shows the pre- and post-test means in four specific dimensions: **"Identifying problems"**, **"Seeking information"**, **"Processing information"** and **"Communicating results"**. In the experimental group (EG), a significant increase is observed in all dimensions after the intervention. For example, in "Identify problems", the mean increased from 13.47 to 17.88, reflecting a marked improvement in the students' ability to recognize and define research problems. Likewise, the dimension "Communicating results" showed a significant increase, going from 14.71 to 18.23, suggesting a strengthening in the ability to express and argue the findings.

In contrast, the control group (CG) showed no significant improvement. The pre- and post-test means in dimensions such as "Seeking information" and "Processing information" remained practically the same, while in "Communicating results" there was even a slight decrease (from 14.71 to 13.94). These results suggest that the alternative program applied in the CG did not have the same positive impact as the workshop implemented in the SG.

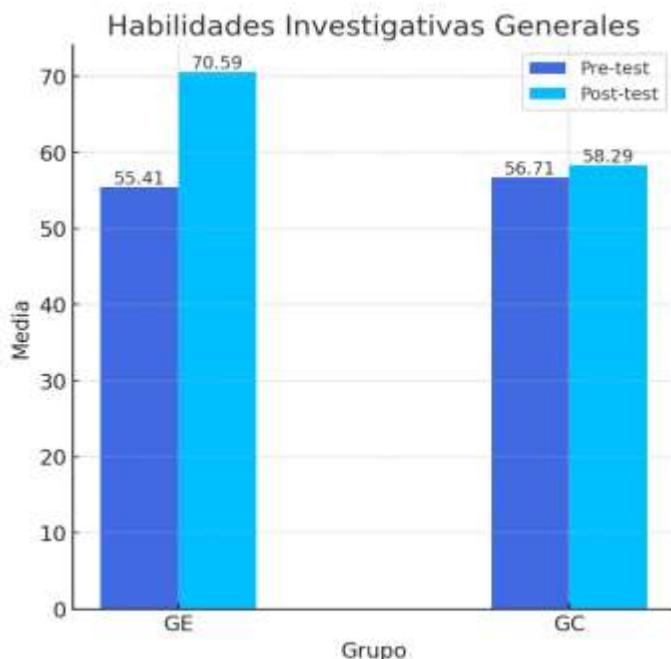
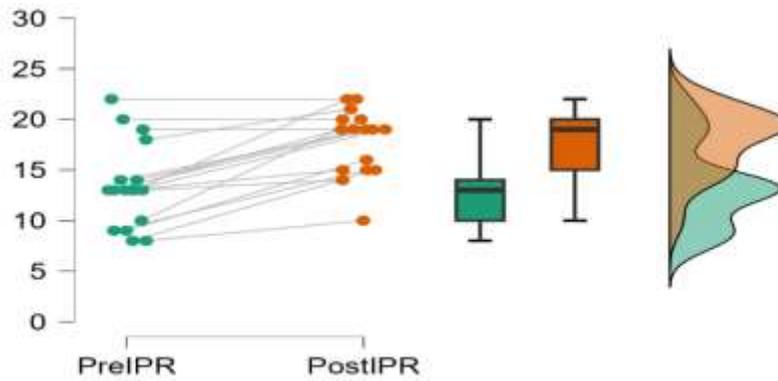


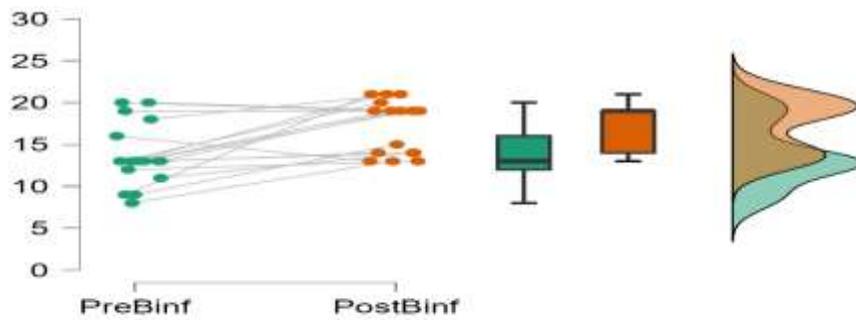
Figure 2: Comparison of GE and GC means of research skills

The second figure shows the pre- and post-test comparison of the general mean of research skills. In the experimental group, the mean increased from 55.41 to 70.59, indicating significant progress in the acquisition of research skills after participation in the workshop. In contrast, in the control group, the mean only increased slightly from 56.71 to 58.29, which shows that the alternative program applied did not produce relevant changes in the development of these skills.

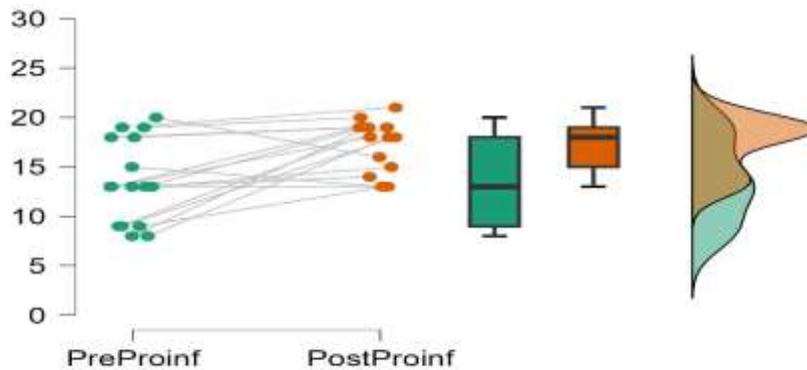
Annexes:



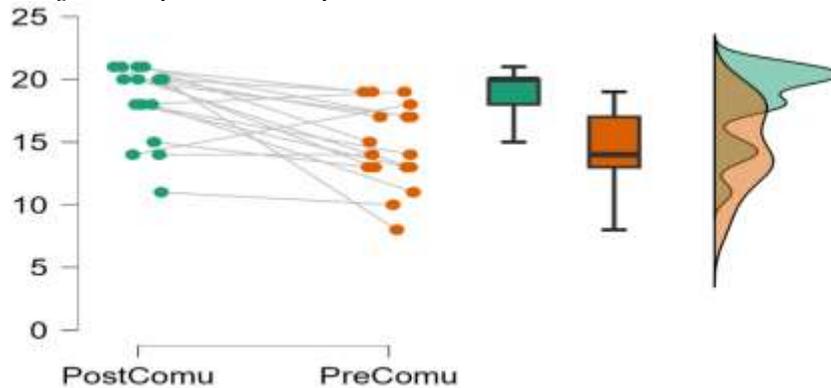
Rain chart for Pre- and Post-test measurement of the dimension identifying problems in the GE



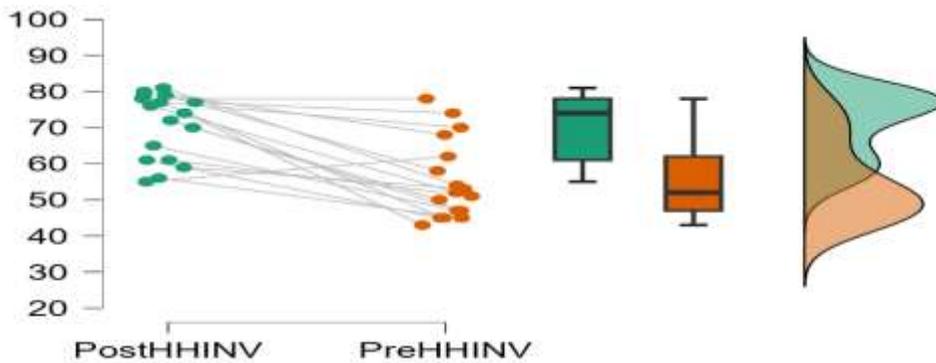
Rainfall chart for Pre and Post test measurement of the information seeking dimension in the GE



Rain chart for Pre- and Post-test measurement of the information processing dimension in the GE.



Rain chart for Pre- and Post-test measurement of the dimension communicating results in the GE



Rain chart for Pre- and Post-test measurement of research skills in the GE

Discussion

The results obtained by testing the general hypothesis have statistically evidenced that the digital skills workshop has a significant impact on research skills. In the pre-test, similar levels of research skills were observed, while in the post-test, more pronounced differences were reported, favoring the experimental group over the control group. This difference in the means was corroborated by the application of the Whitney Mann U test, which determined a significance below the established parameter, leading to evidence that the digital skills workshop implemented in the experimental group had the desired effect of increasing the levels of research skills.

The results are consistent with the study of Reyes et al. (2020) , whose research has reported that the application of technological tools in research contributes positively to the increase of research skills of university students, since these tools facilitate the research processes.

These results show congruence with what was reported by Solís (2024) who has pointed out that the integration of technologies such as artificial intelligence favors research skills since they provide resources, tools or applications that facilitate the research process. This integration of

technologies in academic activities represents a great opportunity to improve learning; however, specifies that their application should be supportive and not replace the cognitive contribution of individuals.

The findings are also compatible with Mustofa et al. (2024) , in whose study they reported that training in digital competencies provided to a group of future teachers does contribute to improving their competitiveness. These researchers emphasize the importance of acquiring technological knowledge as it is crucial to have the ability to adapt to the educational needs of students.

Reference

- Cárdenas, M. P., Soto, M. V., & Oñate, J. A. (2023). Active methodologies in the digital era. Epistemic approach to the educational fact. *LATAM Revista Latinoamericana de Ciencias Sociales y Humanidades*,4 (1), 667-682. <https://doi.org/10.56712/latam.v4i1.278>
- Casanova, T., Vásquez, M., Casanova, J., Becerra, L., Chávez, A., Inca, E., Barba, E., Segura, A., Carrillo, L., Villa, S., Bermeo, E., Cepeda, J., Solís, M., Andino, L., Escobar, H., Caranqui, S., Mera, S., De La Cruz, G., Cundar, A., and Bermúdez, J. (2022). *Research, innovation and inclusion*. Editorial de la Universidad Nacional de Chimborazo (UNACH). <https://doi.org/10.37135/u.editorial.05.74>
- Galeano, M. E. (2020). *Project design in qualitative research*. Universidad Eafit.
- García Dlhigo, J. (2022). *Research methodology for administrators* (1.ª ed.). Ediciones de la U.
- Haşlamam, T., Atman Uslu, N., & Mumcu, F. (2024). Development and in-depth investigation of pre-service teachers' digital competencies based on DigCompEdu: A case study. *Quality and Quantity*,58 (1), 961-986. Scopus. <https://doi.org/10.1007/s11135-023-01674-z>
- Hidalgo Benites, L. E., Haro Haro, C. L. H., & Niño-Carmona, C. A. (2023). Personal learning environments and digital research competencies in students of the National University of Piura. *Educación*,32 (63), 157-178. <https://doi.org/10.18800/educacion.202302.A008>
- Iglesias, M. E. (2021). *Methodology of scientific research: Design and development of protocols and projects*.
- Ipanaqué-Zapata, M., Figueroa-Quiñones, J., Bazalar-Palacios, J., Arhuis-Inca, W., Quiñones-Negrete, M., & Villarreal-Zegarra, D. (2023). Research skills for university students' thesis in E-learning: Scale development and validation in Peru. *Heliyon*,9 (3). <https://doi.org/10.1016/j.heliyon.2023.e13770>.
- Morduchowicz, R. (2021). *Digital competencies and skills*. <https://unesdoc.unesco.org/ark:/48223/pf0000380113.locale=en>
- Mustofa, I., Tandon, M., Jonathan, B., & Tamaela, E. Y. (2024). The Impact of Digital Skills Training on Increasing the Competitiveness of Educators. *Journal Emerging Technologies in Education*,2 (2), 229-240. <https://doi.org/10.70177/jete.v2i2.1068>
- Naupas, H., Mejía, E., Trujillo, I., Romero, H., Medina, W., and Novoa, E. (2023). *Total research methodology: Quantitative - Qualitative and thesis writing* (6.ª ed.). Ediciones de la U.
- Olalla, G.E.V., Fiorini, E.R.B., Romero-Carazas, R., Katiuzca, B.(2022). Detection of Elephantiasis patients using Image processing and Classification methods. *Journal of Pharmaceutical Negative Results*, 13 (3), pp. 789-795 <https://www.pnrjournal.com/index.php/home/article/view/1049/832>
- Ramón-Bautista, M.G., Lopez-Condeña, W.G., Romero-Carazas, R., Valero-Ancco, V.N., Espíritu-Martínez, A.P., Chávez-Choque, M.E.(2023). COMPETENCY-BASED LEARNING ASSESSMENT IN ELEMENTARY SCHOOL STUDENTS: A

- BIBLIOMETRIC ANALYSIS. *Bibliotecas, Anales de Investigacion*, 19 (2) <http://revistas.bnjm.sld.cu/index.php/BAI/article/view/652/557>
- Reyes Pérez, J. J., Cárdenas Zea, M. P., and Gavilánez Buñay, T. C. (2020). Development of research competencies measured by technologies in agronomy undergraduate students. *Conrado*, 16 (73), 108-113. http://scielo.sld.cu/scielo.php?script=sci_abstract&pid=S1990-86442020000200108&lng=es&nrm=iso&tlng=es
- Rueda, L. J., Torres Anaya, L., & Córdova García, U. (2022). Development of research skills in students at a Peruvian university. *Revista Conrado*, 18 (85), 66-72. <https://conrado.ucf.edu.cu/index.php/conrado/article/view/2261>
- Santos Martínez, C. J. (2023). Digital transformation with sMOOC: a proposal based on educommunication. *International Journal of Visual Culture*, 13 (3), 1-23. <https://doi.org/10.37467/revvisual.v10.4581>
- Solis, J. L. (2024). Impact of AI on the research competencies of ESGE students: a groundbreaking study. *Revista Científica de la Escuela Superior de Guerra del Ejército*, 3 (1), 35-43. <https://doi.org/10.60029/rcesge.v3i1art3>
- Tsankov, N., & Damyanov, I. (2019). The Digital Competence of Future Teachers: Self-Assessment in the Context of Their Development. *International Journal of Interactive Mobile Technologies (iJIM)*, 13 , 4. <https://doi.org/10.3991/ijim.v13i12.11068>
- Zapata Domínguez, Á., and Lombana Coy, J. (2023). *Guía práctica para elaborar proyectos de investigación aplicada en administración, gerencia y negocios*. Universidad del Norte. https://www.google.com.pe/books/edition/Gu%C3%ADa_pr%C3%A1ctica_para_elaborar_proyectos/WA7eEAAAQBAJ?hl=es-419&gbpv=1&dq=investigaci%C3%B3n+b%C3%A1sica+y+aplicada&pg=PA40&printsec=frontcover.