

**PERCEPTION OF SCIENTIFIC AND TRANSVERSAL COMPETENCIES IN NURSING STUDENTS: A COMPARATIVE ANALYSIS BETWEEN UNIVERSITY COHORTS**

**PERCEPÇÃO DAS COMPETÊNCIAS CIENTÍFICAS E TRANSVERSAIS EM ESTUDANTES DE ENFERMAGEM: ANÁLISE COMPARATIVA ENTRE COORTES UNIVERSITÁRIAS**

**PERCEPCIÓN DE LAS COMPETENCIAS CIENTÍFICAS Y TRANSVERSALES EN ESTUDIANTES DE ENFERMERÍA: ANÁLISIS COMPARATIVO ENTRE COHORTES UNIVERSITARIOS**



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**ABSTRACT**

In higher education in health sciences, the development of scientific and transversal competencies is essential for training professionals capable of critically analyzing evidence and applying it in clinical practice. The aim of the study was to compare the perception of scientific and transversal competencies among nursing students between the periods 2019 and 2025, in order to identify possible differences associated with the educational contexts in which their training took place. Materials and Methods: A quantitative, non-experimental, cross-sectional, and comparative study was conducted among undergraduate nursing students at a public university in Nayarit, Mexico. The sample consisted of 331 students

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selected through non-probabilistic convenience sampling. Data were collected using a questionnaire based on an ad hoc instrument and analyzed using descriptive and inferential statistics, employing  $\chi^2$  and Mann-Whitney U tests ( $p < 0.05$ ). Results: The findings showed that transversal competencies were mainly at intermediate levels of development, highlighting teamwork and ethical and social commitment. In contrast, scientific competencies showed lower levels of perceived mastery, particularly in methodological skills. Conclusions: The findings highlight the need to strengthen research training and to promote pedagogical strategies aimed at critical thinking and scientific literacy among nursing students.

**Keywords:** Scientific Competencies. Transversal Competencies. Nursing Students. Higher Education. Perception of Competencies.

## RESUMO

Na educação superior em ciências da saúde, o desenvolvimento de competências científicas e transversais é fundamental para a formação de profissionais capazes de analisar criticamente as evidências e aplicá-las na prática clínica. O objetivo do estudo foi comparar a percepção das competências científicas e transversais em estudantes de enfermagem entre os períodos de 2019 e 2025, com o intuito de identificar possíveis diferenças associadas aos contextos educacionais nos quais sua formação ocorreu. Materiais e Métodos: Foi realizado um estudo quantitativo, não experimental, transversal e comparativo com estudantes do curso de graduação em Enfermagem de uma universidade pública de Nayarit, México. A amostra foi composta por 331 estudantes selecionados por meio de amostragem não probabilística por conveniência. Os dados foram coletados por meio de um questionário baseado em um instrumento ad hoc e analisados por meio de estatística descritiva e inferencial, utilizando os testes  $\chi^2$  e U de Mann-Whitney ( $p < 0,05$ ). Resultados: Os resultados mostraram que as competências transversais situaram-se predominantemente em níveis intermediários de desenvolvimento, com destaque para o trabalho em equipe e o compromisso ético e social. Em contraste, as competências científicas apresentaram níveis mais baixos de percepção de domínio, particularmente nas habilidades metodológicas. Conclusões: Os achados ressaltam a necessidade de fortalecer a formação em pesquisa e promover estratégias pedagógicas voltadas ao pensamento crítico e à alfabetização científica entre estudantes de enfermagem.

**Palavras-chave:** Competências Científicas. Competências Transversais. Estudantes de Enfermagem. Educação Superior. Percepção de Competências.

## RESUMEN

En la educación superior en ciencias de la salud, el desarrollo de competencias científicas y transversales es fundamental para la formación de profesionales capaces de analizar críticamente la evidencia y aplicarla en la práctica clínica. El objetivo del estudio fue comparar la percepción de las competencias científicas y transversales en estudiantes de enfermería entre los periodos 2019 y 2025, con el fin de identificar posibles diferencias asociadas a los contextos educativos en los que se desarrolló su formación. Materiales y métodos: Se realizó un estudio cuantitativo, no experimental, transversal y comparativo en estudiantes de la Licenciatura en Enfermería de una universidad pública de Nayarit, México. La muestra estuvo integrada por 331 estudiantes seleccionados mediante muestreo no probabilístico por conveniencia. La información se recolectó mediante un cuestionario basado en un instrumento ad hoc y se analizó mediante estadística descriptiva e inferencial, utilizando pruebas  $\chi^2$  y U de Mann-Whitney ( $p < 0.05$ ). Los resultados mostraron que las competencias

transversales se ubicaron principalmente en niveles intermedios de desarrollo, destacando el trabajo en equipo y el compromiso ético y social. En contraste, las competencias científicas presentaron menores niveles de percepción de dominio, particularmente en habilidades metodológicas. Conclusiones: Los hallazgos resaltan la necesidad de fortalecer la formación investigativa y promover estrategias pedagógicas orientadas al pensamiento crítico y la alfabetización científica en estudiantes de enfermería.

**Palabras clave:** Competencias Científicas. Competencias Transversales. Estudiantes de Enfermería. Educación Superior. Percepción de Competencias.

## 1 INTRODUCTION

In recent decades, higher education systems have progressively transitioned towards training models focused on the development of skills. This change seeks to strengthen the comprehensive training of students and respond to the social, scientific and professional demands of contemporary society. From this perspective, current pedagogical proposals promote the integration of knowledge, skills, and attitudes that allow students to function in complex and constantly changing contexts. (Covarrubias Apablaza et al., 2022; Saravia Domínguez et al., 2024)

Competency-based education is based on the need for training processes to transcend the transmission of theoretical content and promote the development of skills that allow students to apply knowledge in real situations. In this approach, competencies are understood as the integrated mobilization of conceptual, procedural and attitudinal knowledge that allows responding in a pertinent way to diverse academic and professional situations (Covarrubias Apablaza et al., 2022). This educational model has been widely adopted in higher education, particularly in areas related to health sciences, where the complexity of health problems requires professionals with analytical skills, critical thinking and informed decision-making capacity.

In the field of health sciences, competency-based education has acquired increasing relevance, favoring the training of professionals capable of analyzing scientific information, addressing clinical problems and supporting their decisions on available evidence. In the case of nursing, the development of scientific competencies is a fundamental element, since it contributes to the strengthening of critical thinking, the consolidation of evidence-based practice and the improvement of the quality of care provided to patients. (Machado et al., 2024) (Saravia Domínguez et al., 2024)

Scientific competencies include methodological knowledge, analytical skills, and attitudes aimed at understanding, producing, and applying scientific knowledge in health care contexts. Among these skills are the systematic search of scientific literature, the critical evaluation of information, the understanding of different methodological designs and the use of basic statistical tools to interpret research results. Its development favors the training of reflective professionals, capable of assessing the available evidence and contributing to the continuous improvement of health systems. (Karazhigitova et al., 2024) (de Oliveira Bernardino et al., 2023)

From a training perspective, the development of scientific competencies in nursing students is closely related to the incorporation of scientific literacy processes. This concept refers to the ability to understand phenomena related to science, interpret evidence-based

information and participate in an informed way in decision-making related to health and social well-being (Cuevas Romo et al., 2016). In the context of university education, scientific literacy helps future professionals to develop a critical stance towards the available information and strengthen their ability to integrate scientific knowledge into clinical practice.

In a complementary way, contemporary educational models have incorporated the development of transversal competences. These refer to general skills that allow students to perform effectively in different academic, professional and social contexts. They include skills related to critical thinking, academic communication, knowledge management, collaborative work and self-regulation of learning. The integration of scientific and transversal competencies favors a more complete professional training, by articulating technical skills with cognitive, social and ethical capacities necessary for the exercise of the profession. (Loura et al., 2020)

Various international organizations have pointed out that competencies imply the integrated mobilization of knowledge, skills, and attitudes to respond to individual and social demands in specific contexts. The Organization for Economic Cooperation and Development (OECD) has stressed that its development is a central element in training citizens capable of facing the challenges of the knowledge society. In this sense, the integration of scientific and transversal skills favors a more complete professional training, by articulating technical skills with cognitive, social and ethical capacities necessary for the exercise of the profession. (OECD, 2025)

In nursing education, the scientific dimension is incorporated transversally into the curricula with the purpose of strengthening the students' ability to understand health-related phenomena, interpret research results and apply scientific evidence in professional practice. However, the development of these competencies does not depend solely on the formal curriculum. Factors associated with the educational context, pedagogical strategies, opportunities for participation in research activities and the institutional conditions in which the training process takes place also intervene. (Arévalo-Ipanaqué et al., 2023)

Evidence indicates that student participation in research projects and scientific dissemination activities contributes significantly to the strengthening of scientific competencies and critical thinking. However, in many nursing programs, participation in these types of experiences remains limited, which may influence how students perceive their own development in the scientific field. (Quiñones Gurrola et al., 2025) (Cuba Sancho & Vivas, 2016)

In the context of higher education in the area of health sciences, some studies have analyzed the perception that students have about the development of their scientific

competencies. At a public university in Nayarit, and collaborators conducted research with 388 students from health programs using an instrument composed of 69 items distributed in six sections aimed at characterizing scientific competence. The results showed that, although students recognize the importance of scientific skills for their professional training, there are still areas of opportunity related to the application of the scientific method, the use of technological tools for research, and the mastery of methodological aspects such as research designs and sampling techniques. These findings suggest the need to strengthen pedagogical strategies aimed at promoting the development of scientific competencies and student participation in research activities during university education. (Ruiz Bernés et al., 2019)

Starting in 2020, the COVID-19 pandemic generated important transformations in the academic organization of higher education institutions, including the adoption of virtual or hybrid teaching modalities and adjustments in clinical practices. These conditions gave rise to cohorts that studied under different educational contexts, which could have influenced the way they perceive the development of their scientific and transversal competencies. (OECD, 2025)

In the context of public universities in the state of Nayarit, Mexico, empirical evidence on this topic is still limited, particularly in comparative studies between cohorts formed in different academic periods. Therefore, the present study aims to compare the perception of scientific and transversal competencies in nursing students between the periods 2019 and 2025, in order to identify possible differences associated with the educational contexts in which their training was developed.

## 2 MATERIALS AND METHODS

**Study design:** A quantitative, non-experimental, cross-sectional and comparative study was carried out, aimed at analyzing the differences in the perception of scientific and transversal competencies in nursing students belonging to two temporary cohorts corresponding to the academic periods 2019 and 2025.

**Population and sample:** The population was made up of students enrolled in the Bachelor's Degree in Nursing at a public university in the state of Nayarit, Mexico. Enrollment was 1,046 students in 2019 and 953 in 2025 (N = 1,999). The sample was obtained through non-probabilistic convenience sampling and was made up of 331 students: 192 from the 2019 period (76.6% women) and 139 from the 2025 period (56.1% women). (Hernández Sampieri & Mendoza Torres, 2018)

**Variables:** The independent variable was the academic period (2019 and 2025) and the dependent variable was the perception of academic competencies, made up of scientific competencies and transversal competencies. Sociodemographic variables such as sex were also considered. Transversal competencies included analytical and synthesis skills, time planning, second-language communication, criticism and self-criticism, creativity, teamwork, interdisciplinary work, and social ethical engagement.

**Instruments:** The information was collected through a structured questionnaire based on the ad hoc instrument to assess the perception of scientific competencies in university students. The instrument included 47 items distributed in seven sections: sociodemographic data, transversal competencies linked to scientific activity, use of information technologies in research, generation of scientific knowledge, experiences of scientific dissemination, knowledge of data analysis software and perception of the influence of the academic program on the development of scientific competencies. Dichotomous questions (yes/no) and some open-ended questions predominated. (Ruiz Bernés et al., 2019)

**Procedure:** Data collection was carried out through an online questionnaire developed in Google Forms, distributed to nursing students during the corresponding academic periods. Participation was voluntary and anonymous. Participants were previously informed about the objectives of the study and agreed to participate through informed consent.

**Statistical analysis:** Descriptive and inferential statistics were applied. Frequencies and percentages were calculated to describe the sample. To compare the 2019 and 2025 cohorts, the chi-square test ( $\chi^2$ ) in categorical variables and the Mann-Whitney U test were used to analyze differences in the perception of competencies. A significance level of  $p < 0.05$  was considered.

**Ethical considerations:** The study was conducted in accordance with the **Declaration of Helsinki** and the **General Health Law on Health Research in Mexico**. It was classified as **risk-free research**, as it only involves the application of surveys or questionnaires where the subjects are not identified or sensitive aspects of the behavior are discussed. Voluntary participation, anonymity and confidentiality of information were guaranteed. (World Medical Association, 2024; Regulations of the General Health Law on Health Research, 2014)

### 3 RESULTS AND DISCUSSION

Table 1 characterizes the participation of 331 students of the Bachelor's Degree in Nursing, of which 192 (58.0%) corresponded to the 2019 academic period and 139 (42.0%) to the 2025 period. In the total sample, the female sex predominated with 225 participants

(68.0%), while 106 (32.0%) were men. When comparing both periods, differences were observed in the distribution by sex, with a higher proportion of women in 2019 and a relative increase in male participation in 2025. This behavior is consistent with the trend observed in nursing training programs, where female enrollment has historically predominated, although in recent years a progressive increase in male participation in this discipline has been reported (Sharma & Begum, 2023).

**Table 1**

*Characterization of the participants*

Variables	2019	2025	Total
	f, %	f, %	f, %
Gender			
Female	147, 63.3	78, 34.7	225, 100.0
Male	45, 42.5	61, 57.5	106, 100.0
Total	192, 58.0	139, 42.0	331, 100.0

Table 2 shows that the perception of transversal competencies showed that, in both periods, the predominant category was "has the notion", which suggests an intermediate level of development of these skills among students. This result coincides with studies that indicate that many transversal competencies in higher education are developed gradually and, sometimes, implicitly within the academic curriculum (Albarrán Villalba, 2018; Magnoler, 2018).

**Table 2**

*Perception and skill of the transversal competence of nursing students by response period*

Perception and Skill of Transversal Competence – 2019	Acquired	He has the notion	Not Acquired
	f, %	f, %	f, %
Analyze and synthesize	22, 11.5	155, 80.7	15, 7.8
Plan your time	57, 29.7	112, 58.3	23, 12.0
Time Management	75, 39.1	108, 56.3	9, 4.7
Comprehension of texts in the second language	6, 3.1	50, 26.0	136, 70.8
Communicate in writing in a second language	6, 3.1	38, 19.8	148, 77.1
Communicate orally in a second language	7, 3.6	48, 25.0	137, 71.4
Criticism and self-criticism	45, 23.4	133, 69.3	14, 7.3
Act creatively	96, 50.0	90, 46.9	6, 3.1
Work as a team	121, 63.0	69, 35.9	2, 1.0
Working in interdisciplinary contexts	9, 4.7	59, 30.7	124, 64.6
Ethical and social commitment	115, 59.9	74, 38.5	3, 1.6
Perception and Skill of Transversal Competence – 2025			
Analyze and synthesize	3, 2.2	111, 79.9	25, 18.0
Plan your time	23, 16.5	78, 56.1	38, 27.3
Time Management	28, 20.1	93, 66.9	18, 12.9

Comprehension of texts in the second language	2, 1.4	38, 27.3	99, 71.2
Communicate in writing in a second language	1, 0.7	36, 25.9	102, 73.4
Communicate orally in a second language	1, 0.7	50, 36.0	88, 63.3
Criticism and self-criticism	9, 6.5	98, 70.5	32, 23.0
Act creatively	37, 26.6	96, 69.1	6, 4.3
Work as a team	100, 71.9	39, 28.1	0, 0.0
Working in interdisciplinary contexts	8, 5.8	68, 48.9	63, 45.3
Ethical and social commitment	42, 30.2	89, 64.0	8, 5.8

In particular, cognitive competencies such as analyzing and synthesizing information showed a decrease in the proportion of students who reported having acquired this skill in 2025 compared to 2019. A similar trend was observed in the ability to plan and manage time, where the proportion of students who indicated that they had not fully developed this competence increased.

These variations could be related to changes in learning processes in increasingly digitized educational contexts. Various authors have pointed out that, although access to information has been significantly expanded with the use of digital technologies, this does not necessarily translate into the strengthening of critical thinking or complex cognitive skills if it is not accompanied by pedagogical strategies aimed at reflection and in-depth analysis of information. (González Ttito et al., 2025; Karipbayeva et al., 2023)

On the other hand, competencies related to the mastery of a second language presented the lowest levels of perception of proficiency in both periods analyzed. Most of the students reported not having acquired sufficient skills for written comprehension and communication in a foreign language. This result coincides with research that has indicated that the mastery of scientific English continues to be one of the main limitations for access to international academic literature in health sciences students in Latin America (Marcillo-García Concepción Elizabeth et al., 2024; Salamonson et al., 2008) .

In contrast, interpersonal competencies, particularly teamwork and ethical and social commitment, presented the highest levels of mastery perception. The ability to work in a team showed high percentages in both periods, which is consistent with the training approach of nursing, a discipline that promotes collaborative work and social responsibility within professional practice (Wu, 2025) .

The comparative analysis between the periods showed variations in some transversal competencies, with decreases in skills related to time management, creativity and critical capacity, while competencies related to collaborative and interdisciplinary work showed trends of improvement (See Table 3).

**Table 3**

*Percentage comparison ( $\Delta\%$ ) of the perception and ability of transversal competences between 2019 and 2025*

Transversal competence	Percentage comparison ( $\Delta\%$ )		
	Acquired	He has the notion	Not Acquired
Analyze and synthesize	-9.3	-0.8	10.2
Plan your time	-13.2	-2.2	15.3
Time Management	-19.0	10.6	8.2
Comprehension of texts in the second language	-1.7	1.3	0.4
Communicate in writing in a second language	-2.4	6.1	-3.7
Communicate orally in a second language	-2.9	11	-8.1
Criticism and self-criticism	-16.9	1.2	15.7
Act creatively	-23.4	22.2	1.2
Work as a team	8.9	-7.8	-1.0
Working in interdisciplinary contexts	1.1	18.2	-19.3
Ethical and social commitment	4.1	-8.3	4.2

Inferential analysis using the Mann-Whitney U test confirmed statistically significant differences between periods in several cross-cutting competencies, particularly in analyzing and synthesizing information, planning and managing time, criticism and self-criticism, creativity, interdisciplinary work, and ethical and social engagement ( $p < 0.05$ ). These results suggest that the perception of the development of certain competencies may be influenced by factors associated with the educational context and the training experiences of each cohort (See Table 4).

**Table 4**

*Comparison of the perception and skill of the transversal competence of nursing students between response periods*

Perception and skill of transversal competence	Female	Male	Total
Analyze and synthesize	4788.0**	1157.0*	10998.0**
Plan your time	4849.5*	940.5**	10359.5**
Time Management	4783.0*	1003.5**	10266.0**
Comprehension of texts in the second language	5544.0	1162.0	13228.0
Communicate in writing in a second language	5454.5	1193.0	12939.0
Communicate orally in a second language	5037.0*	1174.5	12421.5
Criticism and self-criticism	4473.0**	967.5**	9638.5**
Act creatively	4810.0*	963.0**	10242.0**
Work as a team	5233.0	1159.5	12114.5
Working in interdisciplinary contexts	4542.0*	1258.0	10844.0**
Ethical and social commitment	3985.5**	1060.5*	9221.0**

\*  $p < 0.05$  and \*\* $p < 0.01$  with Mann-Whitney U.

In relation to scientific competencies linked to the generation and application of knowledge, the results showed a predominance of the "not acquired" category in both periods analyzed, which suggests limitations in the development of research skills among students.

This behavior is consistent with what was reported in a previous study carried out at the same institution by those who evaluated the perception of scientific competencies in students in the area of health sciences using an instrument of 69 items applied to 388 participants. In this study, limitations in skills related to the application of research designs, sampling techniques, and the use of methodological tools were also identified, which suggests that the strengthening of research training continues to represent a challenge within academic programs in the health area (See Table 5). Bernés et al. (2019)

**Table 5**

*Perception for the generation and dissemination of scientific knowledge in nursing students by response period*

<b>Generation and dissemination of knowledge – 2019</b>	<b>Acquired</b>	<b>Not Acquired</b>
	<b>f, %</b>	<b>f, %</b>
Knows how to apply experimental designs	67, 34.9	125, 65.1
Knows how to apply non-experimental designs	56, 29.2	136, 70.8
Knows how to apply sample selection techniques	33, 17.2	159, 82.8
Considers statistical methods for data analysis to be important	119, 62	73, 38
<b>Generation and dissemination of knowledge - 2025</b>		
Knows how to apply experimental designs	47, 33.8	92, 66.2
Knows how to apply non-experimental designs	33, 23.7	106, 76.3
Knows how to apply sample selection techniques	7, 5.0	132, 95.0
Considers statistical methods for data analysis to be important	39, 28.1	100, 71.9

Table 6 shows that in particular, low levels of mastery perception were identified in aspects such as knowledge of sample selection techniques and the assessment of statistical methods for data analysis. Likewise, a decrease was observed in the proportion of students who recognized the importance of statistics for the analysis of scientific information in the most recent period.

These findings coincide with research that indicates that, in many health sciences training programs, research teaching tends to concentrate on isolated theoretical subjects, without sufficient integration with practical research experiences, which limits the development of scientific competencies in students (Koritzinsky et al., 2017; Wu, 2025).

Similarly, the study identified that a significant proportion of students reported not having fully developed skills related to the application of experimental and non-experimental designs, as well as the use of sample selection techniques. These findings reinforce the idea that, although the curricula include content related to research methodology, the effective development of these competencies requires training experiences more linked to research practice and the active participation of students in scientific projects. Bernés et al. (2019)

The comparative analysis between cohorts showed statistically significant differences in some scientific competencies, particularly in the knowledge of sampling techniques and in the assessment of statistical methods, while the differences observed in the application of experimental and non-experimental designs did not reach statistical significance.

**Table 6**

*Percentage comparison ( $\Delta\%$ ) between periods of perception for the generation and dissemination of scientific knowledge*

Competition	Percentage comparison ( $\Delta\%$ )	
	Acquired	Not Acquired
Knows how to apply experimental designs	-1.1	1.1
Knows how to apply non-experimental designs	-5.5	5.5
Knows how to apply sample selection techniques	-12.2	12.2
Considers statistical methods for data analysis to be important	-33.9	33.9

The comparative analysis by sex (Table 7) showed differences in the perception of some scientific competencies. In general, women reported higher levels of mastery in research-related skills, particularly in the application of experimental designs, non-experimental designs, and assessment of statistical methods, where statistically significant differences were identified using the Mann-Whitney U test ( $p < 0.01$ ).

**Table 7**

*Comparison of the generation and dissemination of knowledge of the transversal competence of nursing students between response periods*

Generation and dissemination of knowledge	Female	Male	Total
Knows how to apply experimental designs	5374.5	1260.5	13199.5**
Knows how to apply non-experimental designs	5487.0	1299.0	12620.0**
Knows how to apply sample selection techniques	5008.5*	1265.0	11722.5
Considers statistical methods for data analysis to be important	3918.0**	809.5**	8817.5

\*  $p < 0.05$  and \*\* $p < 0.01$  with Mann-Whitney U.

Some studies have suggested that health sciences students tend to be more involved in academic activities related to critical analysis and research, which could be associated with high levels of academic engagement and thought-oriented learning styles (Bovijn et al., 2017).

In this sense, studies carried out on health sciences students have indicated that the strengthening of scientific competence requires not only the teaching of methodological content, but also the integration of technological tools, innovative didactic strategies and the participation of interdisciplinary research groups that favor situated learning and the

development of scientific thinking. These recommendations have also been pointed out in previous research carried out in the same student population, where the need to strengthen research training through the incorporation of new pedagogical strategies within the university curriculum is raised (Ruiz Bernés et al., 2019).

Overall, the results of this study suggest that, although nursing education favors the development of interpersonal and ethical competencies, there are still areas of opportunity in the strengthening of scientific and critical thinking competencies. In this sense, several authors have pointed out the need to integrate pedagogical strategies that promote the active participation of students in research processes, such as problem-based learning, training projects and early research experiences within the university curriculum (Bovijn et al., 2017; González Ttito et al., 2025; Wu, 2025).

#### **4 CONCLUSIONS**

The study made it possible to compare the perception of the development of scientific and transversal competencies in nursing students between the 2019 and 2025 cohorts, identifying differences associated with the educational contexts in which their training was developed. In general, transversal competencies were located at intermediate levels of development, with the category "has the notion" predominating. Skills related to teamwork and ethical and social commitment were perceived as the most strengthened, which is consistent with the nursing's training approach.

In contrast, scientific competencies presented more limited levels of perception of mastery, particularly in methodological skills related to the research process, such as knowledge of sampling techniques and the evaluation of statistical methods. The differences observed between cohorts suggest that the educational context can influence the perception of the development of these competencies, which highlights the need to strengthen research training and promote pedagogical strategies aimed at the development of critical thinking and scientific literacy.

#### **5 FINAL CONSIDERATIONS**

The study has some limitations. The use of non-probability sampling for convenience and the application of self-reporting instruments may limit the generalizability of results and be subject to perception biases. Likewise, the cross-sectional comparative design between cohorts allows us to identify differences between periods, but not to establish causal relationships. In addition, since it is carried out in a single institution, the findings must be interpreted within that educational context.

The results show the need to strengthen training in scientific and transversal competencies in nursing programs through pedagogical strategies that promote critical thinking and scientific literacy. Future research could use longitudinal designs or multicenter studies that allow for a more in-depth analysis of the educational factors associated with the development of these competencies.

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