



BMJ Open Development of critical thinking skills of undergraduate students throughout the 4 years of nursing degree at a public university in Spain: a descriptive study

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ABSTRACT

Objective To analyse the critical thinking skills of students enrolled in the four academic years of the nursing degree at a public university belonging to the European Higher Education Area.

Design Cross-sectional, quantitative, descriptive study. Using the Critical Thinking Questionnaire to analyse the critical thinking skills in their substantive and dialogic dimension.

Setting Faculty of Nursing, Valladolid Public University in Spain, belonging to the European Higher Education Area.

Participants The sample consisted of 215 first-year, second-year, third-year and fourth-year undergraduate nursing students.

Main outcomes The students of the four academic years were positively disposed towards critical thinking. The students of the final courses obtained higher average scores.

Results The study sample was 215 students, 19.1% men/80.9% women. The average score in the substantive dimension (3.81 ± 0.53 points) was higher than that in the dialogic dimension (3.48 ± 0.51 points) ($p < 0.001$). They had a greater ability in listening and speaking (3.77 ± 0.61 points) with respect to writing (3.65 ± 0.61 points) and reading (3.52 ± 0.43 points) ($p < 0.001$). There are significant differences in the critical thinking average scores across academic years.

Conclusions Nursing students displayed a greater critical thinking ability in its substantive dimension compared with the dialogic one. This reflects a greater ability in actions related to provide reasons and evidence that support their point of view. Identifying critical thinking skills in nursing students will help establish specific teaching methodologies focused on improving these skills.

INTRODUCTION

Critical thinking is a high-level way of thinking widely studied and described throughout history. In 1987, Ennis defined it as ‘reasoned and thoughtful thinking that focuses on deciding what to believe or what to do’.¹ Other authors reflect on the relationship and connection between critical thinking and creative thinking.^{2,3}

Strengths and limitations of this study

- Critical thinking is a key element in applying evidence-based practice to improve decision making.
- The questionnaire is validated and has been used in other studies for the analysis of critical thinking in undergraduate university students.
- The decision to opt for non-randomisation was made to encourage voluntary participation in the study by all students enrolled in the 4 years of the nursing degree.
- A high rate of voluntary participation was achieved among all students.
- The main limitation could be the social desirability bias that is characteristic of this kind of study.

Santiuste-Bermejo *et al*⁴ highlight the fact that critical thinking is a reflective, metacognitive thinking, which makes it apt for self-evaluation and self-optimisation. According to the American Philosophical Association, critical thinking is an intentional, self-regulating judgement integrated by cognitive skills that can be grouped and subclassified in several legitimate ways.⁵ Santiuste-Bermejo *et al* defines two critical thinking dimensions: substantive and dialogic. The substantive dimension encompasses actions related to provide reasons and evidence that support each particular point of view. The dialogic dimension encompasses actions directed towards the analysis and integration of points of view that are contrary to our own. The elements that measure these critical thinking dimensions are listening to others, acting differently, thinking autonomously and anticipating search processes, and raising the existence of courses of action not necessarily logical. All of them are skills that should be considered in nursing studies.⁴

Enhancing the capacity to reflect and the clinical judgement among university students is one of the main objectives of the degree curricula in the international university educational context. Promoting learning based on critical thinking and its integration in research will improve the effectiveness of the interventions of future professionals.^{6,7} Developing critical thinking skills in their substantive and dialogic dimensions in nursing students will positively impact their professional performance in providing safe and effective care, as well as in the nursing practice and decision-making skills.⁸

There are several studies on critical thinking skills of university students, among which those conducted in nursing students are noteworthy.^{9,10} Their conclusions reveal that the development of critical thinking skills improves the students' reflective abilities as well as scientific competences.^{7,9,11}

The complexity of the health system demands nurses to develop their critical thinking, an essential tool for decision making.¹² Nursing as a discipline should be based on care research and the use of good clinical practices.^{11,13,14} Critical thinking is a key element to make progress in evidence-based practice and provide safe patient-centred care.^{15,16}

There is a variety of tools to assess critical thinking. Particularly noteworthy are the California Critical Thinking Skills Test (www.insightassessment.com) not adapted to nursing students, the Health Sciences Reasoning Test validated in health science,¹⁷ the Nursing Critical Thinking Questionnaire in clinical practice (practice NCT4)¹⁸ and the CPC2 Critical Thinking Questionnaire.⁴ In view of the different assessment tools for critical thinking, Yue *et al* suggest using uniform measurements and conducting high-quality studies that provide more evidence in the choice of the evaluation method.¹⁹

Since the ability to think critically is a long-term process integrated by teaching, practice and clinical work, and there are different instruments to evaluate it, it would be very beneficial to find an agreement in the standard way to assess it, as well as to perform high-quality studies.¹⁹ Instruments that measure critical thinking skills in nursing students and nurses have to be designed in a more precise way.²⁰ These instruments will contribute to define the concept of critical thinking according to the context without forgetting that it is an individual, situational and acquired ability.²¹

Improving critical thinking abilities during nursing education is a long-term process that must be assessed in the different stages of learning in a comprehensive manner.¹⁹ The current learning context of the European Higher Education Area has promoted a common reference framework (European Qualification Framework (EQF)) which connects the qualification systems of the countries of the European Union in order to enhance the transparency and transferability of professionals' qualifications between countries. The Spanish university system has structured the nursing degree syllabus into four academic years of 60 credits; thus, the whole degree is 240 credits (EQF level 6).

This is a challenge for teachers, who now seek greater interaction with students, encouraging motivation and actively involving them in their learning process.²²

Teachers have to consider the weight of sociodemographic variables in the development of critical thinking skills. Nursing students are mainly women, which means that is difficult to relate this variable and its influence on the development of critical thinking.⁸

Therefore, the development of critical thinking skills in future nursing professionals is a key element to enhance evidence-based practice that improves decision making. The aim of this work was to assess the critical thinking skills of students in the four academic years of the nursing degree at a public university belonging to the European Higher Education Area.

METHODS

Study design

Cross-sectional, quantitative, descriptive study using the validated questionnaire Critical Thinking Questionnaire CPC2,⁴ in the Nursing Faculty of the University of Valladolid during 2017. This questionnaire approaches the formal logic of critical thinking as well as other aspects such as listening to others, autonomous thinking, anticipation of search processes and courses of action not necessarily logical.

Participants and sample size

The study population was 486 students enrolled in the four academic courses of the nursing degree: 124 in the first year, 126 in the second, 108 in the third and 128 in the fourth year. The subject coordinators of the four academic years encouraged participation and facilitated access to information about the study, emphasising the voluntary nature of their participation. A total of 215 students voluntarily agreed to respond to the survey, giving express written consent to be part of the study.

The CPC2 was conducted from 1–31 May 2017 through the Virtual Campus online platform of the University of Valladolid to which all nursing degree students have access. All the students gave their consent to participate in it.

Patient and public involvement

No patient was involved in this study.

Data collection

The CPC2 consists of 30 questions aimed at addressing the substantive and dialogic dimensions of critical thinking in reading, writing, listening and speaking. The sociodemographic variables included in the questionnaire were age and gender.

The answers are evaluated on a 1–5 scale being 1, total disagreement; 2, disagreement; 3, sometimes; 4, agreement; and 5, total agreement. The answers were grouped, categorising them as follows: 1–2 points (less ability), 3

Table 1 Overview of demographic variables

		Women	Men	Total
Students, n (%)		174 (80.9)	41 (19.1)	215 (100%)
Age ($\bar{x}\pm$ SD)		22.01 \pm 5.41	21.61 \pm 4.47	21.92 \pm 5.24
Academic year, N (%)	First year	60 (34.5)	12 (29.3)	72 (33.5)
	Second year	25 (14.4)	10 (24.4)	35 (16.3)
	Third year	20 (11.5)	3 (7.3)	23 (10.7)
	Fourth year	69 (39.7)	16 (39)	85 (39.5)

points (neutral) and 4–5 points (ability). Questions 2 and 22 are expressed in denial, so their value is reversed.

The questions of the CPC2 addressed to evaluate the substantive dimension in reading are 1, 11, 13, 16, 17, 18, 19, 21, 24, 25, 28 and 30 (minimum score=12, maximum score=60). In writing, they are 4, 9, 10, 23, 26 and 29 (minimum score=6, maximum score=30). In listening and speaking, they are 3, 8, 14 and 27 (minimum score=4, maximum score=20).

The questions that evaluate the dialogic dimension in reading are 2, 7, 12 and 22 (minimum score=4, maximum score=20). In writing, they are 5 and 6 (minimum score=2, maximum score=10). In listening and speaking, they are 15 and 20 (minimum score=2, maximum score=10).

The questionnaire was validated in Spanish by Santiuste-Bermejo *et al*⁴ and is a reliable tool with a Cronbach alpha value of 0.90.⁴ Regarding the reliability of the questionnaire, Cronbach's alpha test was applied, obtaining values greater than 0.70 for each of the axes.

Statistical analysis

The statistical program used to analyse the variables was IBM SPSS V.24.0, considering a level of statistical significance of $p<0.05$. The quantitative variables were described as mean \pm SD; the qualitative variables were described by absolute and relative frequencies (percentages). Comparisons of quantitative values were made by analysis of variance; post hoc we applied least significant difference and Tamhane's T2.²³ In the case of qualitative variables, we applied the χ^2 test by using contingency tables. The effect size was calculated with Cohen's d.

RESULTS

The study sample included 215 nursing degree students, with a mean age of 21.92 \pm 5.24, 19.1% male students and 80.9% female students (table 1).

The prevailing age ranges per academic year were 18–19 years in the first year, 19–20 years in the second year, 20–21 years in the third year and 21–23 years in the fourth year. The distribution of students by gender and academic year did not show significant differences, with a higher percentage of female students in every academic course.

The average score of the sample in the substantive dimension (3.81 \pm 0.53 points) was higher than that in the dialogic dimension (3.48 \pm 0.51 points) ($p<0.001$). When analysing the results for each of the academic courses, the average scores obtained between the substantive and the dialogic dimensions did not show significant differences.

Students displayed a greater ability in listening and speaking (3.77 \pm 0.61 points) compared with writing (3.65 \pm 0.61 points) and reading (3.52 \pm 0.43 points) ($p<0.001$).

Table 2 shows the mean scores of critical thinking skills in the four academic years of the nursing degree. They presented statistically significant differences in reading ability in the substantive dimension, with the third year being the one with the highest average score (3.93 \pm 0.47). The writing ability in the substantive dimension had a higher average score in the second year (4.01 \pm 0.63) and also writing ability in the dialogic dimension in the fourth year (3.69 \pm 0.66).

Table 2 Average scores for critical thinking skills in the four academic years of the nursing degree

Dimension and skill	Year of study								P value
	First		Second		Third		Fourth		
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Substantive reading	3.58	0.62	3.86	0.66	3.93	0.47	3.85	0.50	0.008
Dialogic reading	3.26	0.56	3.28	0.57	3.22	0.39	3.29	0.36	0.942
Substantive writing	3.63	0.56	4.01	0.63	3.98	0.54	3.94	0.55	0.001
Dialogic writing	3.19	0.90	3.50	0.86	3.37	0.71	3.69	0.66	0.002
Substantive listening and speaking	3.69	0.73	4.01	0.73	3.95	0.58	3.83	0.58	0.095
Dialogic listening and speaking	3.60	0.79	3.89	0.80	3.87	0.66	3.74	0.67	0.212

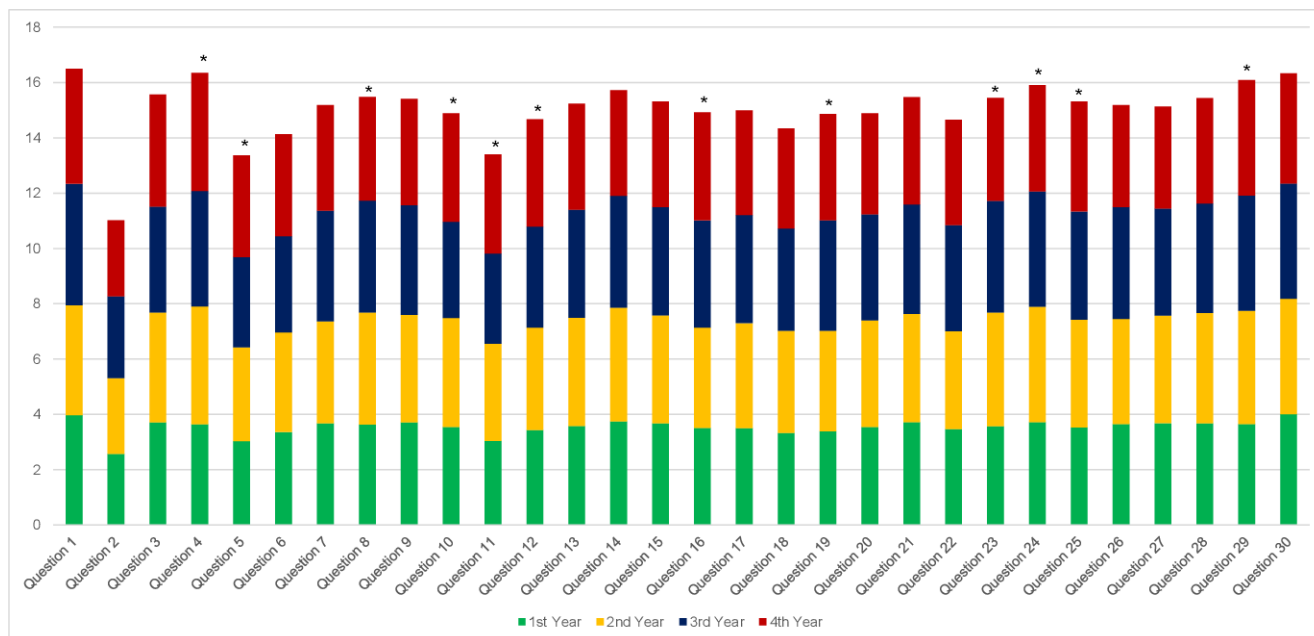


Figure 1 Comparison by academic year of the average score of each of the questions. *P value<0.05.

There are no significant differences in the mean scores in the critical thinking skills evaluated between the substantive and dialogic dimensions, depending on gender; data were not displayed in text. However, female students presented higher average scores compared with male students in reading (3.53 ± 0.43 points vs 3.47 ± 0.43 points) and writing (3.68 ± 0.61 points vs 3.51 ± 0.58 points), while male students had a higher average score in the listening and speaking abilities (3.79 ± 0.54 points vs 3.77 ± 0.63 points).

Analysing the 30 questions one by one, we found that question 1, corresponding to the reading ability in its substantive dimension, obtained the highest average score compared with the rest (4.09 ± 0.77 points) ($p<0.001$). Question 5, corresponding to writing ability in its dialogic dimension, had the lowest average score (3.37 ± 1.02 points) ($p<0.001$). In both questions, the average score did not show significant differences by gender, although female students obtained higher average scores.

When analysing the average scores of all the questions between each of the academic courses (figure 1), statistically significant differences ($p<0.05$) were observed in questions 4, 5, 8, 10, 11, 12, 16, 19, 23, 24, 25 and 29.

Those questions which presented statistically significant differences for each of the academic courses were studied and grouped by skills (reading, writing, listening and speaking). In reading (questions 11, 12, 16, 19, 24 and 25), the highest average score prevailed in the fourth year (66.6%) and third year (33.3%). In writing (questions 4, 5, 10, 23 and 29), fourth year students had a higher average score (60%), followed by second-year students (40%). Regarding listening and speaking (question 8), second-year students obtained the highest average score.

When analysing the average scores of each question according to gender, we observed no significant

differences in the whole sample population. However, a higher average score prevailed in female students in every question except in those of reading ability (questions 11, 17, 18, 19, 24 and 28) and listening and speaking (questions 14, 20 and 27).

When analysing the average score of each answer by gender splitting them by academic year, we found that there were no statistically significant differences between male students in the four academic courses, except for question 14 (listening and speaking), in which the score in the second year was higher (4.5 ± 0.52 points) compared with those in the third year (4.33 ± 0.57 points) and the first (3.75 ± 0.86 points) and fourth (3.75 ± 0.77 points) years ($p<0.05$).

Regarding female students, there were significant differences between the average scores and academic year in reading (questions 1, 11, 12, 13, 16, 19, 22 and 25) and writing (questions 4, 5, 10, 23 and 29), with a higher average score prevailing in the third and fourth years, with the first year being the one with the lowest average scores (table 3).

By categorising the answers to the questionnaire according to ability level (figure 2), we observed that first-year students presented less ability in critical thinking. The highest average scores prevailed in questions corresponding to writing (questions 4, 5, 6, 9, 10, 23 and 29), followed by reading (questions 11, 16 and 19), and listening and speaking (question 3) ($p<0.05$).

DISCUSSION

It is essential to assess critical thinking skills in nursing degree students throughout their academic journey to establish specific educational strategies in each academic year. These strategies will allow analysis of the differences

Table 3 Results of the average scores of the questions with significant differences in female students by academic year

Questions	Year of study				P value
	First	Second	Third	Fourth	
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	
1. When an author exposes several possible solutions to a problem, I value the usefulness of each of them.	3.95±0.81	3.96±0.88	4.45±0.51	4.20±0.67	0.031
4. When I look for information to write a paper, I judge whether the sources I manage are reliable or not.	3.63±1.28	4.40±0.95	4.05±0.99	4.32±0.91	0.002
5. In my papers, in addition to the main thesis on the subject, I present alternative opinions of other authors and sources.	3.08±1.12	3.48±1.19	3.40±0.99	3.72±0.78	0.005
10. When I write the conclusions of a paper, I clearly justify each one.	3.55±0.98	3.92±1.03	3.55±0.94	3.96±0.75	0.042
11. When an author exposes a solution to a problem, I assess whether he has also exposed all the necessary conditions to put it into practice.	3.03±1.08	3.40±1.25	3.25±0.96	3.61±0.82	0.015
12. When I read an opinion or a thesis I don't take sides with it until I have enough evidence or reasons to justify it.	3.43±0.99	3.72±1.10	3.65±0.67	3.94±0.82	0.021
13. When I read a text, I clearly identify the irrelevant information and disregard it.	3.57±0.92	3.84±0.98	4.05±0.68	3.94±0.72	0.040
16. When I read an argumentative text, I clearly identify the arguments that confirm or refute a thesis.	3.48±1.01	3.64±1.11	3.95±0.82	3.90±0.68	0.040
19. When an author exposes several possible solutions to a problem, I assess whether all of them are equally possible to implement.	3.38±0.86	3.60±1.08	4±0.64	3.80±0.71	0.008
22. When I read something with which I disagree, I consider if I may be wrong and the author may be right.	3.55±0.81	3.28±1.17	3.80±0.89	3.87±0.87	0.026
23. When I write on a subject, I clearly differentiate between facts and opinions.	3.58±0.96	4.08±0.95	4.10±0.44	3.71±0.84	0.030
25. I ask myself if the texts I read have arguments still valid today.	3.58±0.94	3.92±0.75	3.85±1.08	4.01±0.75	0.044
29. When I write an idea that is not mine, I reference the sources from which it comes.	3.72±1.02	4.16±0.85	4.25±0.71	4.23±0.87	0.009

in their abilities according to the formative and practical maturity. Educators must be mindful about the relationship between personal development and critical thinking in order to set strategies that enhance the ability to think holistically.²⁴

The predisposition of the nursing degree students showed interest in integrating critical thinking to solve cases, an aspect described in other studies.²⁵ In our study, the highest average scores were monitored in the substantive dimension versus the dialogic dimension, so it can be said that the students displayed greater ability in the actions related to endorse the reasons and pieces of evidence that support their own point of view than in those directed towards the analysis and integration of contrary points of view. This highlights the need to improve discussion forums in the classroom. Teaching methods such as the inverted class promote critical thinking compared with other traditional methodologies.²⁶ In order to enhance critical thinking skills in

their dialogic dimension, students need to take part in their learning process through problem explanation, the production of possible hypotheses, the debate of issues related to the subject matter and the divergent views.²⁷

Regarding critical thinking skills, listening and speaking abilities had a higher average score than writing and reading abilities, respectively. This contrasts with the traditional teaching methodologies—widely used in university teaching—with regard to reading and argumentation abilities, as opposed to others more engaging for students such as problem-based learning.²⁸ Naber and Wyatt conducted a pretest–post-test experimental study to assess the reflexive writing skills of nursing students in the USA, stating the importance of this activity to improve the development of critical thinking.²⁹ Therefore, it is essential to design educational strategies that enhance analytical willingness.²⁰

Per academic course, first-year students displayed less ability in critical thinking compared with other courses;

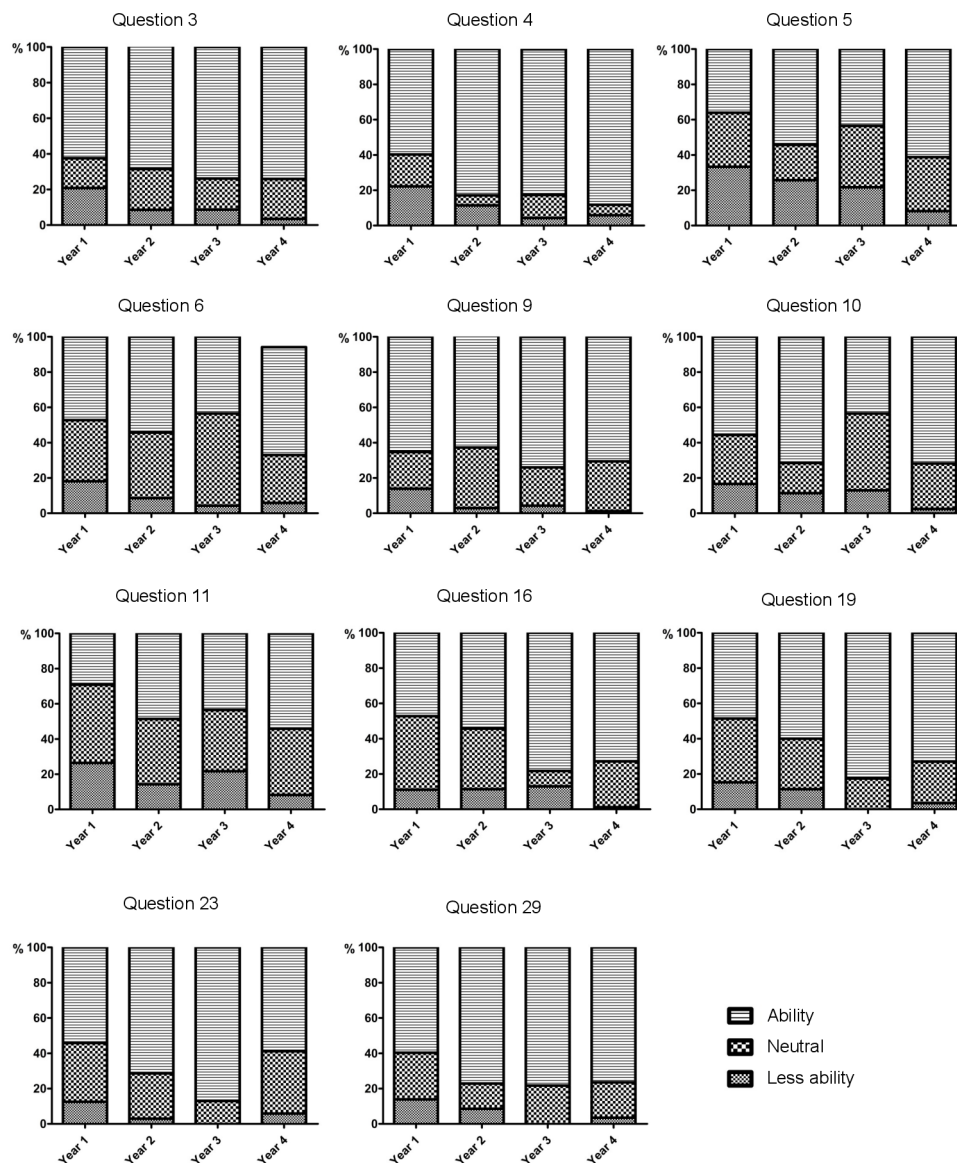


Figure 2 Classification of responses according to critical thinking ability level. P value<0.05.

second-year students had a higher average score in writing in its substantive dimension; third-year students obtained a higher average score in reading in its substantive dimension; and fourth-year ones were better in writing in its dialogic dimension. Kim *et al*³⁰ state that critical thinking willingness tends to increase according to academic level. This may be due to the impact of clinical experience in nursing undergraduate education, with first-year students being the most inexperienced in this field compared with those who begin their clinical practice, who are more likely to have a greater predisposition to critical thinking. Hunter *et al*³¹ point out that the academic year is a significant predictor of critical thinking, inductive and deductive reasoning skills, with first-year students getting the lowest scores. The variability in critical thinking skills among academic courses suggests the difference that may exist between teaching methods, which enhance some skills over others. Another factor to consider are the clinical practices in hospitals and health centres, and their

impact on the development of critical thinking skills of third-year and fourth-year students.³²

Critical thinking skills are expected to improve as academic courses progress. Some studies show a positive relationship between age and academic course, and obtaining higher critical thinking skills scores.^{8,33}

Female students in the sample had a higher score in reading and writing skills compared with male students, who obtained higher average scores in listening and speaking. This contrasts with other works, in which critical thinking skills do not show differences depending on gender.^{31,34} The proportion of female students in our study sample is significantly higher than that of male students, so it is difficult to compare results with other studies.

Regarding each question individually, question 1 had the highest average score in every academic course, while question 5 had the lowest. Therefore, it is easier for students to choose a solution to a problem

when they are given several options as opposed to their ability to seek alternative opinions from other sources. The students displayed inclination to support a thesis or opinion that agrees with their point of view without considering arguments against it. This shows that they struggle in the process of dialogic reading, which could be related to the lack of interest of the student in other interpretations different from one's own. Florin *et al.*,⁷ in their study of 26 Swedish universities, found great differences in students in terms of the difficulty that they have to extract relevant information and evaluate knowledge critically, which they attribute to the different educational curricula and pedagogical methods. Noone and Seery revealed in their work that students presented skillfulness in the dispositions of analytical mentality, curiosity and maturity, but were weak in the search for truth.³⁵

Implications for research

In order to encourage critical thinking in nursing students, the commitment of educators is crucial in the integration of new teaching methodologies in the classroom that reinforce the growth of critical thinking and its subsequent professional development.²⁸

Critical thinking enables nurses to express higher levels in clinical reasoning, judgement, decision making and problem solving.³⁶ Given the increasing complexity of healthcare, patients require technical and clinical excellence in nurses. In turn, educational institutions must ensure that their students develop these skills to provide quality and safe patient care.²⁵

Consequently, further studies are required to explore the impact of improving critical thinking skills on the effectiveness of the interventions conducted by nurses and on the health outcomes of patients.

Limitations of the study

The main limitations of the study are those inherent to its methodological design, especially the social desirability bias, which could be corrected by randomising the sample. However, we favoured the option of allowing all students who wished to answer the questionnaire to do so in order to obtain as large a sample as possible.

CONCLUSIONS

The students achieved better results in the substantive dimension compared with the dialogic one. This fact indicates that, in general, they have a greater ability to support their own point of view than to analyse and integrate opposite perspectives. It can be concluded that, overall, the current teaching methodology contributes to improve critical thinking skills as academic years advance. However, practical training in healthcare centres also has an impact on these skills that remains to be determined. What is certain is that better critical thinking skills in nursing students will enable them to provide better professional healthcare.

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