

# The impact of an educational intervention on nursing students' critical thinking skills: A quasi-experimental study

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## ABSTRACT

**Aim:** In this study, we identified the impact of educational activities that focused on improving the competence and critical thinking skills of university nursing students.

**Design:** A prospective quasi-experimental study was conducted, and assessments were conducted before and after the educational intervention, which consisted of seminars, lectures, case studies, and problem-solving activities.

**Methods:** The Critical Thinking Questionnaire was used to collect data before and after the educational intervention between September 2017 and May 2018. The sample consisted of 112 first-year undergraduate students. To examine the data that were collected as a part of this quasi-experimental study, inferential statistics were used, and the results were tested against a significance level of  $P < 0.05$ .

**Results:** The students obtained higher scores on the substantive dimension than on the dialogic one, and women scored higher than men. The educational intervention led to an improvement in every critical thinking skill across both dimensions, except listening and speaking skills, whereby men demonstrated a greater change in average scores for critical thinking skills.

**Conclusions:** The educational intervention improved the critical thinking skills of undergraduate students and had a greater impact on men than on women. This finding underscores the need for educational interventions that can enhance critical thinking skills. Developing these skills will improve future nurses' ability to make health care management decisions in a reflective, agile, and evidence-based manner.

## 1. Introduction

Critical thinking is an important research tool that allows one to make useful and self-regulatory judgments through analysis, interpretation, evaluation, and inferential reasoning. Therefore, the facilitation of critical thinking skills necessitates a commitment to create learners who are flexible, honest, cautious, and diligent in their search for information and base their thinking in reason (Facione, 1990).

Scholarship on critical thinking dates back to the work of philosophers like Socrates, Plato, and Descartes, who were advocates of in-depth reasoning and argued that all knowledge should be questioned. They promoted the development of attributes that include the analysis of information, decision-making, and reflection (Von Colln-Appling and Giuliano, 2017).

The ambiguity of the concept of critical thinking has resulted in the

emergence of diverse approaches to teaching that have influenced health science educators, but these definitional differences underscore the need for flexibility in conceptualising the term (Kahlke and Eva, 2018).

Critical thinking is a crucial nursing skill because it is essential to the provision of quality care that is rendered with professional responsibility (Paul, 2014). Critical thinking should be a skill that nurses inherently possess; therefore, we should design strategies to promote this ability (Carvalho et al., 2017). Authors have argued that improving the critical thinking skills of nursing students will have positive effects on their self-reflection abilities and care behaviours (Chen et al., 2018).

In their daily work, nurses must make important decisions within a short time period; these decisions can affect a patient's condition. Consequently, thinking quickly and anticipating the results of interventions is a part of their work. Thus, such critical thinking skills must

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be developed during the formative stages. It is educators who are responsible for ensuring the attainment of critical thinking skills (Von Colln-Appling and Giuliano, 2017).

The development of critical thinking skills becomes a learning challenge, both for the student and the educator who is responsible for knowledge transmission and choice of teaching method (Johanns et al., 2017). Grasping and integrating the essence of what it means to think critically should lead to significant reflections upon the subject. Further, we have to consider the role that educators play as well as the social and contextual factors that affect the critical thinking of nursing students (Raymond et al., 2018).

Educators must maximise students' critical thinking skills to help them become competent, effective, and independent (Carter et al., 2016). Adopting evidence-based nursing as a teaching method will promote students' critical thinking skills by enhancing their ability to solve problems that require one to test assumptions, think deductively, provide interpretations, and draw inferences (Cui et al., 2018). Within the framework of the multifaceted nature of critical thinking in nursing education, clinical experiences will also facilitate their development and knowledge application (Raymond et al., 2018).

## 2. Background

The integration of university degrees within the European Higher Education Area entailed changes in the teaching methodology and structure of the subjects that are taught in each university program. In Spain, the changes were published in 2007 (RD 1393/2007), and it favoured a teaching methodology that placed greater emphasis on seminars and classroom practices. In this new educational context, among formative and practical competences, critical thinking becomes highly important (Zuriguél et al., 2015). In order to establish a reflective curriculum within the nursing degree, the development of clinical judgment should be promoted through problem-solving, knowledge production, motivation, and the orientation of students towards lifelong learning (Gholami et al., 2016).

Critical thinking is a complex activity that requires adequate education, time, and personal commitment. Therefore, educators should be involved in the organisation of learning activities and assessments that help students establish coherent arguments (Daly, 2001). To develop teaching skills, research on teaching and evaluation strategies that promote the development of critical thinking skills must be conducted (Drennan, 2010).

Conducting research studies that evaluate teaching strategies is important to the establishment of associations between measured levels of critical thinking and student learning (Carvalho et al., 2017). Within the domain of the nursing profession, the knowledge base is constantly expanding. Therefore, educators must strengthen learning by using active strategies that can effectively enhance critical thinking dispositions (Wangensteen et al., 2010). The study of critical thinking skills can be considered as a tool that can be used to find solutions to minimise the academic and professional failures of nursing students (Pitt et al., 2015).

Among the existing measures of critical thinking (Facione et al., 2011; Alfaro-LeFevre, 2016), a validated questionnaire, namely, the Critical Thinking Questionnaire (CPC2) (Santiuste-Bermejo et al., 2001), was used in the present study because it assesses aspects such as the following: listening to others, acting in a different way, thinking independently, and anticipating search processes. These are skills that nursing students must acquire.

Using uniform measures and conducting high-quality studies will provide robust empirical findings about the impact of educational methods on critical thinking (Yue et al., 2017). Consequently, it is necessary to ascertain the effectiveness of learning activities that aim to improve the skills of nursing students that foster their critical thinking skills.

## 3. Methods

### 3.1. Study Design

This prospective quasi-experimental study was conducted among the first-year undergraduate students of a public Spanish university between the academic year 2017/2018. Further, their critical thinking skills were measured using the previously validated questionnaire CPC2 (Santiuste-Bermejo et al., 2001) before and after they participated in an educational intervention. In addition to assessing the formal logic that critical thinking entails, this questionnaire also measures other aspects of the construct, such as the following: listening to others, autonomous thinking, anticipation of search processes, and ways of acting that are not necessarily logical. To examine the reliability of the questionnaire, Cronbach's alpha was used as an indicator of internal consistency. The alpha values were above 0.70 for all the axes and was 0.90 for the entire scale.

### 3.2. Participants

The study population was 130 first-year nursing students (academic year: 2017/2018). The educational intervention was conducted as a part of one of their course subjects, namely, Fundamentals of Nursing. A total of 112 students participated anonymously and voluntarily, and they provided verbal consent to participate in the study.

### 3.3. Educational intervention

The subject, Fundamentals of Nursing (12 European Credit Transfer and Accumulation System, ECTS), is taught during the first year of the nursing program. The face-to-face learning components of this subject are composed of the following: 87 h of theory, 27 h of classroom practice, and 6 h of laboratory work.

The teaching methods that are used to teach this subject consist of in-class activities (40%), which include the following: lectures, seminars and sessions, problem-based learning, case studies, and tutorials. Non-classroom activities (60%) include the following: papers, cooperative learning, and self-directed study. The educational intervention was conducted as a part of the classroom activities that were used to teach the subject, and it included seminars and sessions, problem-based learning, and case studies.

The actions described in the protocol are as follows:

- Subject: Nursing Fundamentals (1st year of the nursing program)
- Duration: Academic year 2017/2018
- Teaching venue: Classrooms 10 and 13, School of Nursing, University of Valladolid
- Material resources: Video projector, whiteboard, Wi-Fi connection for members of the University of Valladolid, notebook, pen, personal electronic devices (e.g. smartphones, tablets, laptops), and specific materials for practice activities (e.g. books, magazines, scientific articles)
- Human resources: Students who were enrolled in the course, Fundamentals of Nursing, and the professor who taught this subject
- Teaching method: In order to facilitate student participation and interaction with the faculty, students were divided into 4 equally sized work groups. A total of 22 activities were conducted throughout the academic year with each work group. Each activity lasted for 50 min, and attendance was mandatory.
- The general contents that were covered in chronological order were as follows: The historical evolution of nursing, basic concepts and theoretical framework, conceptual models, and nursing methodology.
- The educational intervention consisted of the following components:
  - o Five activities were based on a critical reading of different book chapters, which in turn were related to the historical evolution of

**Table 1**

Descriptive statistics for the pre- and post-intervention critical thinking skills of men and women students.

		Dimensions	Women		Men		P-value
			Mean	SD	Mean	SD	
Pre-educational intervention	Reading	Substantive	45.70	5.81	44.12	5.91	0.882
		Dialogic	13.45	2.32	12.75	1.83	0.281
	Writing	Substantive	24.23	2.91	21.50	1.19	0.014
		Dialogic	6.92	1.65	6.37	1.18	0.400
	Listening and speaking	Substantive	15.08	2.70	15	1.51	0.012
		Dialogic	7.97	1.35	8.25	1.03	0.271
Post-educational intervention	Reading	Substantive	46.93	6.51	47	5.90	0.926
		Dialogic	13.45	2.03	13.66	2.57	0.368
	Writing	Substantive	24.26	3.31	23.73	3.75	0.373
		Dialogic	6.98	1.47	6.80	2	0.214
	Listening and speaking	Substantive	15.46	2.59	15.93	2.81	0.523
		Dialogic	7.76	1.46	7.88	1.80	0.410

SD = standard deviation.

nursing; these activities were conducted in September and October 2017.

- o Five activities were based on a critical reading of scientific articles, which in turn were related to the theoretical framework and basic concepts of the discipline; these activities were conducted in November and December 2017.
- o Four activities were based on problem-solving through a nursing assessment; these activities were conducted in February and March 2018.
- o Eight activities were based on a case study on nursing care planning; these activities were conducted in March, April, and May 2018.

### 3.4. Data collection

The CPC2 was shared through an online platform of the virtual campus of the University of Valladolid, to which all students who had enrolled in the course had access. Data collection occurred in two phases: the first was on September 18, 2017 before doing the activity, and the second phase on May 21, 2018, after its completion. The CPC2 consists of 30 questions that assess the substantive and dialogic dimensions of critical thinking in reading, writing, listening, and speaking. The socio-demographic variables that the questionnaire assessed were age and gender.

The substantive dimension encompasses actions that pertain to the reasons and evidences that support each particular point of view. The dialogic dimension encompasses actions that are directed towards the analysis and integration of points of view that are contrary to those of the self.

The answers are evaluated on a 1–5 scale being 1: total disagreement, 2: disagreement, 3: sometimes, 4: agreement and 5: total agreement. To interpret the answers, it is considered that there is a difficulty for the development of the question raised if the result is between 1 and 2 points, with not too much difficulty if the result is 3 points, and with no difficulty between 4 and 5 points. Questions 2 and 22 are expressed in denial, so their value is reversed.

The following questions of the CPC2 assess the substantive dimension of critical thinking in reading, writing, and listening and speaking, respectively: (a) 1, 11, 13, 16, 17, 18, 19, 21, 24, 25, 28, and 30 (minimum score = 12, maximum score = 60); (b) 4, 9, 10, 23, 26, and 29 (minimum score = 6, maximum score = 30); and (c) 3, 8, 14, and 27 (minimum score = 4, maximum score = 20).

The following questions assess the dialogic dimension of critical thinking in reading, writing, and listening and speaking, respectively: (a) 2, 7, 12, and 22 (minimum score = 4, maximum score = 20); (b) 5 and 6 (minimum score = 2, maximum score = 10); and (c) 15 and 20 (minimum score = 2, maximum score = 10). The reliability of the test was found to be 0.90 (Santiuste-Bermejo et al., 2001).

### 3.5. Ethical considerations

This study was approved by the Ethics Committee for Scientific Research in the Valladolid Este Health Area, which belongs to the Health Service of Castilla y León, in April 2017 (reference number: PI 17-809).

### 3.6. Statistical analysis

The software program that was used to analyse the data was IBM SPSS version 24.0. The quantitative variables were examined using means and standard deviations (SD), and the qualitative variables were examined using absolute and relative frequencies (percentages). Changes in clinical variables that resulted from the educational intervention were examined using student's *t*-test and the Mann-Whitney *U* test. Comparisons of qualitative variables were undertaken using the chi-squared test. Fisher's exact test was used when the number of cells with expected values that were < 5 was > 20%. Further, likelihood-ratio test was used for variables with more than two categories. The level of statistical significance was specified as  $P < .05$ .

## 4. Results

The study sample ( $N = 112$ ) consisted of 98 women (86.7%) and 15 men (13.3%). Their average age was  $18.50 \pm 2.81$  years. These first-year nursing students had enrolled in a course, Fundamentals of Nursing, and had no prior experience in university studies. Before the educational intervention, the students demonstrated better critical thinking skills on the substantive dimension than on the dialogic dimension (reading:  $45.54 \pm 5.80$  vs.  $13.37 \pm 2.27$ , writing:  $23.96 \pm 2.90$  vs.  $6.87 \pm 1.62$ , and listening and speaking:  $15.07 \pm 2.60$  vs.  $8 \pm 1.32$  points;  $P < .001$ ).

The analysed sample presented a high starting score, with not too much difficulty or with no difficulty in critical thinking skills. The lowest average ( $3.20 \pm 1.01$ ) emerged for the fifth question, which assessed the dialogic dimension of critical thinking in writing, and the highest average ( $4.31 \pm 0.74$ ) emerged for the first question, which assessed the substantive dimension of critical thinking in reading. Table 1 shows the average scores that men and women obtained. Women obtained higher average scores on all aspects, except the dialogic dimension of critical thinking in listening and speaking.

Even after the educational intervention, the students demonstrated better critical thinking skills on the substantive dimension than on the dialogic one (reading:  $46.94 \pm 6.41$  vs.  $13.48 \pm 2.05$ , writing:  $24.19 \pm 3.36$  vs.  $6.96 \pm 1.54$ , and listening and speaking:  $15.53 \pm 2.61$  vs.  $7.77 \pm 1.50$  points;  $P < .001$ ).

The average scores had not changed significantly after the intervention, and the emergent high scores indicated that the sample could

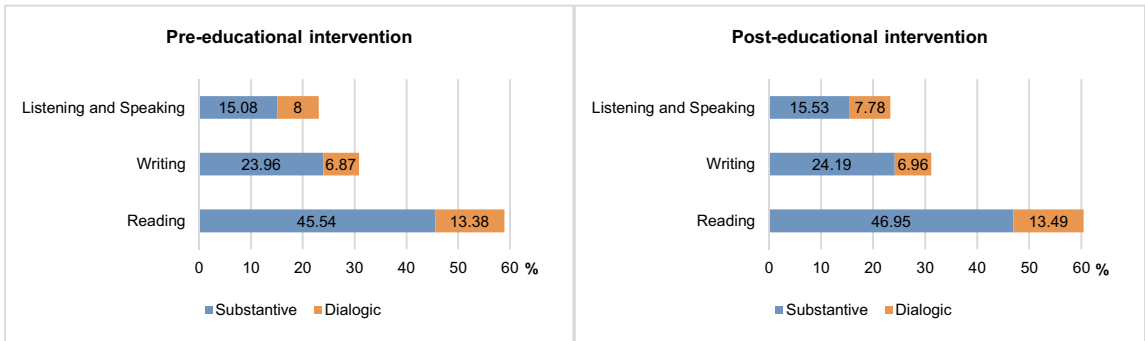


Fig. 1. Changes in the substantive and dialogic dimensions of critical thinking skills.

use their critical thinking skills with little to no difficulty. The lowest average ( $3.37 \pm 0.93$ ) emerged for the fifth question, which assessed the dialogic dimension of critical thinking in writing, and the highest average ( $4.18 \pm 0.80$ ) emerged for the first question, which assessed the substantive dimension of critical thinking in reading. Regarding the distribution by gender, a higher average score was observed in all questions, but in writing men compared to women showing statistically significant differences (Table 1).

The educational intervention led to an improvement in all critical thinking skills across both dimensions, except listening and speaking (dialogic dimension), which evidenced statistically non-significant results (Fig. 1).

The average scores that both men and women had obtained on both dimensions had increased after the intervention. However, there was a significant improvement in only the substantive dimension of critical thinking in writing among men ( $21.50 \pm 1.19$  vs.  $23.73 \pm 3.75$  points;  $P < 0.05$ ).

Item-wise analysis of responses to the CPC2 revealed that all post-intervention scores were higher (Fig. 2) and that mean scores for questions 19, 21, and 30, which assess the substantive dimension of critical thinking in reading ( $P < 0.05$ ), were significantly higher after the intervention.

5. Discussion

The educational intervention, which was provided to first-year nursing students, included seminars, classes, problem-based learning, and case studies; the intervention improved all the critical thinking skills that are subsumed by the substantive and dialogic dimensions, except listening and speaking (dialogic dimension). This finding may be attributable to the fact that most reasoning and analytic skills are learned in school prior to university entry (Carbogim et al., 2018; Liu et al., 2019).

The participants' average age was 18 years, and the sample was primarily composed of women. Some studies have found that there is a relationship between age and critical thinking, whereby older students obtain higher scores on tests of critical thinking skills (Pitt et al., 2015). Researchers have also found that younger students are more willing to follow instructions and provide written answers, thereby linking cognitive maturity to the ability to derive more complex solutions (Atmatzidou and Demetriadis, 2016).

Before the educational intervention, students demonstrated significantly better critical thinking skills (reading, writing, and listening and speaking) on the substantive dimension than on the dialogic dimension. These results are similar to those of other studies that have

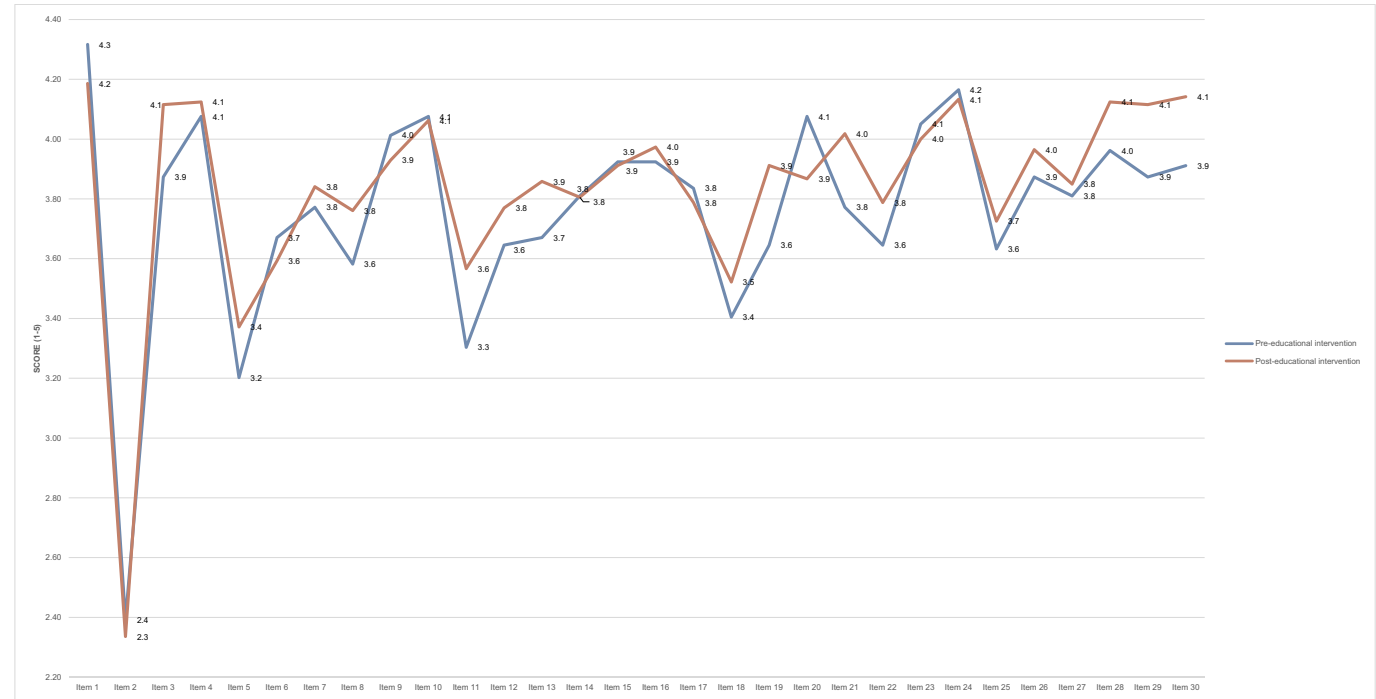


Fig. 2. Analysis of pre- and post-intervention scores on the Critical Thinking Questionnaire.

examined the critical thinking skills of university students (Huggins and Stamatel, 2015; Paim et al., 2015).

Women obtained higher average scores than men across all critical thinking skills and dimensions, except listening and speaking (dialogic dimension). Some studies have found that boys are more reluctant to use written expressions than girls (Atmatzidou and Demetriadis, 2016). However, when the role of age was also examined, older women were found to demonstrate better critical thinking skills than men, across both dimensions. This finding may be attributable to cultural and social influences during childhood that originate from the family environment. Specifically, women adopt the role of a caregiver, and caregiving is an attribute that is closely linked to the development of critical thinking skills (Liu et al., 2019).

When compared to women, the present intervention led to a significant improvement in men's critical thinking skills, except with regard to listening and speaking (dialogic dimension); in these domains, average scores had decreased among both men and women. In other studies, women have obtained higher scores on tests of critical thinking skills before a learning intervention, whereas men have demonstrated improvements in such skills after an intervention (Dehghanzadeh and Jafaraghaee, 2018).

Pre-existing educational models had adopted teaching strategies in which (a) the main focus was not the student, (b) student participation in class was passive, and (c) there was little interaction between the student and educator. Thus, such models did not encourage the development of critical thinking skills. In contrast, the current educational model is based on an educational methodology that favours student participation and adopts teaching strategies that facilitate student empowerment and improvement of critical thinking skills (Swart, 2017; Carbogim et al., 2018; Erlam et al., 2018; Hong and Yu, 2017). This may explain why students demonstrated greater critical thinking skills in the substantive reading dimension, both before and after the intervention. Indeed, higher scores emerged for the item that assessed the value that is ascribed to the usefulness of various possible solutions that had been presented for a problem.

In this study, the lowest pre- and post-intervention scores emerged for writing ability (dialogic dimension), which is related to the inclusion of alternative opinions by other authors and sources in the presentation of written works. This observation is consistent with other findings, which indicate that the major challenges that are faced by students pertain to data interpretation and decision-making (Fero et al., 2010). To improve the dialogic dimension of critical thinking, it is necessary to use small groups and teaching strategies such as debates and simulation games that improve students' communication skills and help them incorporate others' opinions into their own analytic process (Carvalho et al., 2017; Latif et al., 2018).

After the educational intervention, there was a significant improvement in scores across the three substantive dimension items that pertain to reading. These items were linked to the identification of relevant information when reading text, drawing conclusions from the resultant information, and, if an author had proposed several solutions to a problem, assess whether it is possible to implement them. This finding suggests that the inclusion of critical reading and analysis of scientific articles in the intervention was an effective means of promoting critical thinking. It is also consistent with the findings of other studies in which similar strategies have yielded promising results and improved critical thinking skills (Naber and Wyatt, 2014; Dehghanzadeh and Jafaraghaee, 2018).

The contributions of the present study become apparent when they are linked to the ability to think ahead and analyse the consequences of care decisions; these skills are essential attributes of nurses (Noone and Seery, 2018). The results not only serve as an assessment of the critical thinking skills of first-year nursing students but also pose challenges to the development of a formative curriculum and learning evaluation methods.

Further, the acquisition of critical thinking skills occurs over a long

period of time and requires continued education (Zarifsanaiey et al., 2016). The teaching methodology plays a key role in determining whether students acquire critical thinking skills. Classroom discussions promote professional and collaborative dialogue through simultaneous reflection. Students need to experience and enjoy learning, be an active part of the learning process, and avoid playing a passive role, which is associated with teacher-centred learning (Lin et al., 2015). Dialogue is a way of thinking aloud, and it improves one's understanding of care-related decision-making. It is a strategy that helps establish learning connections and validates students' own knowledge and assumptions so that they can improve their assertions (Forneris and Peden-McAlpine, 2009). The enhancement of critical thinking in the classroom can help nursing students be better prepared to use critical thinking skills in their care practice, which is becoming increasingly dynamic, complex, and challenging (Noone and Seery, 2018).

With regard to the limitations of the present study, it is noteworthy that randomisation of the sample was not used. Nevertheless, it is necessary to take into account the diversity of the 22 learning activities that were conducted as a part of the educational intervention and their impact on learning outcomes in the study sample.

Quasi-experimental studies must include an 'exposure', a 'response', and a hypothesis that must be tested. Since the subjects were not randomly assigned to the treatment and control groups, each subject acted as his or her own control counterpart. However, the findings may have been influenced by the Hawthorne effect, whereby participants may have altered their responses because they were aware that they were being studied.

## 6. Conclusions

The educational intervention directly improved critical thinking skills, even though pre-intervention scores were high to begin with. Higher scores emerged for the substantive dimension, when compared to the dialogic one. Women's pre-intervention scores were higher than those of men. However, the educational intervention had a greater impact on men than on women.

The implementation of educational interventions within a university environment promotes the development of critical thinking skills. It would be very interesting to replicate this study in other universities and within the field of health sciences in order to identify common strategies that can be used to enhance students' critical thinking skills. Improving the clinical judgment abilities of future nursing professionals will strengthen decision-making in care management in a reflexive, agile, and evidence-based manner, and have a direct effect on the quality attention of health care system users.

The results of the present study underscore the need to incorporate teaching methodologies that improve the dialogic dimension of critical thinking skills in the nursing curriculum.

## Author contributions

ML, JMJ, BMG, MFC, MJC, MF & MJC, were responsible for the study conception and design. ML & JMJ performed the data collection. ML & JMJ performed the data analysis. ML & JMJ were responsible for the drafting of the manuscript. ML, JMJ, BMG, MFC, MJC, MF & MJC made critical revisions to the paper for important intellectual content. ML, JMJ, BMG, MFC, MJC, MF & MJC supervised the study.

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## Declaration of competing interest

No conflict of interest has been declared by the authors.



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## References

- Alfaro-LeFevre, R., 2016. *Critical Thinking, Clinical Reasoning, and Clinical Judgment: A Practical Approach*, 6th ed. Saunders/Elsevier, Philadelphia, PA.
- Atmatzidou, S., Demetriadis, S., 2016. Advancing students' computational thinking skills through educational robotics: a study on age and gender relevant differences. *Robot. Auton. Syst.* 75, 661–670. <https://doi.org/10.1016/j.robot.2015.10.008>.
- Carbogim, F. da C., Barbosa, A.C.S., de Oliveira Bertacchini, L., de Sá Diaz, F.B., Toledo, L.V., Alves, K.R., Friedrich, D.B.C., Luiz, F.S., Püschel, V.A.A., 2018. Educational intervention to improve critical thinking for undergraduate nursing students: a randomized clinical trial. *Nurse Educ. Pract.* 33, 121–126. <https://doi.org/10.1016/j.nepr.2018.10.001>.
- Carter, A.G., Creed, D.K., Sidebotham, M., 2016. Efficacy of teaching methods used to develop critical thinking in nursing and midwifery undergraduate students: a systematic review of the literature. *Nurse Educ. Today* 40, 209–218. <https://doi.org/10.1016/j.nedt.2016.03.010>.
- Carvalho, D.P.S.R.P., Azevedo, I.C., Cruz, G.K.P., Mafra, G.A.C., Rego, A.L.C., Vitor, A.F., Santos, V.E.P., Cogo, A.L.P., Ferreira Júnior, M.A., 2017. Strategies used for the promotion of critical thinking in nursing undergraduate education: a systematic review. *Nurse Educ. Today* 57, 103–107. <https://doi.org/10.1016/j.nedt.2017.07.010>.
- Chen, S.Y., Chang, H.C., Pai, H.C., 2018. Caring behaviours directly and indirectly affect nursing students' critical thinking. *Scand. J. Caring Sci.* 32 (1), 197–203. <https://doi.org/10.1111/scs.12447>.
- Cui, C., Li, Y., Geng, D., Zhang, H., Jin, C., 2018. The effectiveness of evidence-based nursing on development of nursing students' critical thinking: a meta-analysis. *Nurse Educ. Today* 65, 46–53. <https://doi.org/10.1016/j.nedt.2018.02.036>.
- Daly, W.M., 2001. The development of an alternative method in the assessment of critical thinking as an outcome of nursing education. *J. Adv. Nurs.* 36 (1), 120–130.
- Dehghanzadeh, S., Jafaraghaee, F., 2018. Comparing the effects of traditional lecture and flipped classroom on nursing students' critical thinking disposition: a quasi-experimental study. *Nurse Educ. Today* 71, 151–156. <https://doi.org/10.1016/j.nedt.2018.09.027>.
- Drennan, J., 2010. Critical thinking as an outcome of a Master's degree in nursing programme. *J. Adv. Nurs.* 66 (2), 422–431. <https://doi.org/10.1111/j.1365-2648.2009.05170.x>.
- Erlam, G., Smythe, L., Wright-St Clair, V., 2018. Action research and millennials: improving pedagogical approaches to encourage critical thinking. *Nurse Educ. Today* 61, 140–145. <https://doi.org/10.1016/j.nedt.2017.11.023>.
- Facione, N., Facione, P., Winterhalter, K., 2011. *The Health Sciences Reasoning Test: HSRT—Test Manual*. vol. 2012 The California Academic Press, Millbrae, CA.
- Facione, P.A., 1990. *Critical Thinking: A Statement of Expert Consensus for Purposes of Education Assessment and Instruction "The Delphi Report"*. Santa Clara University, California Academic Press, Millbrae, CA.
- Fero, L.J., O'Donnell, J.M., Zullo, T.G., Dabbs, A.D., Kitutu, J., Samosky, J.T., Hoffman, L.A., 2010. Critical thinking skills in nursing students: comparison of simulation-based performance with metrics. *J. Adv. Nurs.* 66 (10), 2182–2193. <https://doi.org/10.1111/j.1365-2648.2010.05385.x>.
- Forneris, S.G., Peden-McAlpine, C., 2009. Creating context for critical thinking in practice: the role of the preceptor. *J. Adv. Nurs.* 65 (8), 1715–1724. <https://doi.org/10.1111/j.1365-2648.2009.05031.x>.
- Gholami, M., Moghadam, P.K., Mohammadipoor, F., Tarahi, M.J., Sak, M., Toulabi, T., Pour, A.H., 2016. Comparing the effects of problem-based learning and the traditional lecture method on critical thinking skills and metacognitive awareness in nursing students in a critical care nursing course. *Nurse Educ. Today* 45, 16–21. <https://doi.org/10.1016/j.nedt.2016.06.007>.
- Hong, S., Yu, P., 2017. Comparison of the effectiveness of two styles of case-based learning implemented in lectures for developing nursing students' critical thinking ability: a randomized controlled trial. *Int. J. Nurs. Stud.* 68, 16–24. <https://doi.org/10.1016/j.ijnurstu.2016.12.008>.
- Huggins, C.M., Stamatel, J.P., 2015. An exploratory study comparing the effectiveness of lecturing versus team-based learning. *Teach. Sociol.* 43 (3), 227–235. <https://doi.org/10.1177/0092055X15581929>.
- Johanns, B., Dinkens, A., Moore, J., 2017. A systematic review comparing open-book and closed-book examinations: evaluating effects on development of critical thinking skills. *Nurse Educ. Pract.* 27, 89–94. <https://doi.org/10.1016/j.nepr.2017.08.018>.
- Kahlke, R., Eva, K., 2018. Constructing critical thinking in health professional education. *Perspect. Med. Educ.* 7 (3), 156–165. <https://doi.org/10.1007/s40037-018-0415-z>.
- Latif, R., Mumtaz, S., Mumtaz, R., Hussain, A., 2018. A comparison of debate and role play in enhancing critical thinking and communication skills of medical students during problem based learning. *Biochem. Mol. Biol. Educ.* (March), 1–7. <https://doi.org/10.1002/bmb.21124>.
- Lin, C.C., Han, C.Y., Pan, I.J., Chen, L.C., 2015. The teaching-learning approach and critical thinking development: a qualitative exploration of Taiwanese nursing students. *J. Prof. Nurs.* 31 (2), 149–157. <https://doi.org/10.1016/j.profnurs.2014.07.001>.
- Liu, N.Y., Hsu, W.Y., Hung, C.A., Wu, P.L., Pai, H.C., 2019. The effect of gender role orientation on student nurses' caring behaviour and critical thinking. *Int. J. Nurs. Stud.* 89, 18–23. <https://doi.org/10.1016/j.ijnurstu.2018.09.005>.
- Naber, J., Wyatt, T.H., 2014. The effect of reflective writing interventions on the critical thinking skills and dispositions of baccalaureate nursing students. *Nurse Educ. Today* 34 (1), 67–72. <https://doi.org/10.1016/j.nedt.2013.04.002>.
- Noone, T., Seery, A., 2018. Critical thinking dispositions in undergraduate nursing students: a case study approach. *Nurse Educ. Today* 68, 203–207. <https://doi.org/10.1016/j.nedt.2018.06.014>.
- Paim, A.S., Iappe, N.T., Rocha, D.L.B., 2015. Metodologias de ensino utilizadas por docentes do curso de enfermagem: enfoque na metodologia problematizadora. *Enfermería Global* 14 (37), 136–152.
- Paul, S.A., 2014. Assessment of critical thinking: a Delphi study. *Nurse Educ. Today* 34, 1357–1360. <https://doi.org/10.1016/j.nedt.2014.03.008>.
- Pitt, V., Powis, D., Levett-Jones, T., Hunter, S., 2015. The influence of critical thinking skills on performance and progression in a pre-registration nursing program. *Nurse Educ. Today* 35 (1), 125–131. <https://doi.org/10.1016/j.nedt.2014.08.006>.
- Raymond, C., Profetto-McGrath, J., Myrick, F., Strean, W.B., 2018. Balancing the seen and unseen: nurse educator as role model for critical thinking. *Nurse Educ. Pract.* 31, 41–47. <https://doi.org/10.1016/j.nepr.2018.04.010>.
- Santiuste-Bermejo, C., Ayala, C., Barriguete, C., García, E., Gonzalez, J., Rossignoli, J., Toledo, E., 2001. *El pensamiento crítico en la práctica educativa*. Fugaz Ediciones, Madrid, España.
- Swart, R., 2017. Critical thinking instruction and technology enhanced learning from the student perspective: a mixed methods research study. *Nurse Educ. Pract.* 23, 30–39. <https://doi.org/10.1016/j.nepr.2017.02.003>.
- Von Colln-Applying, C., Giuliano, D., 2017. A Concept Analysis of Critical Thinking: A Guide for Nurse Educators. 49 pp. 106–109. <https://doi.org/10.1016/j.nedt.2016.11.007>.
- Wangenstein, S., Johansson, I.S., Björkström, M.E., Nordström, G., 2010. Critical thinking dispositions among newly graduated nurses. *J. Adv. Nurs.* 66 (10), 2170–2181. <https://doi.org/10.1111/j.1365-2648.2010.05282.x>.
- Yue, M., Zhang, M., Zhang, C., Jin, C., 2017. The effectiveness of concept mapping on development of critical thinking in nursing education: a systematic review and meta-analysis. *Nurse Educ. Today* 52, 87–94. <https://doi.org/10.1016/j.nedt.2017.02.018>.
- Zarifanaiey, N., Amini, M., Saadat, F., 2016. A comparison of educational strategies for the acquisition of nursing student's performance and critical thinking: simulation-based training vs. integrated training (simulation and critical thinking strategies). *BMC Med. Educ.* 16 (1), 294 16.
- Zuriguél, E., Lluch, M.T., Falcó, A., Puig, M., Moreno, C., Roldán, J., 2015. Critical thinking in nursing: scoping review of the literature. *Int. J. Nurs. Pract.* 21 (6), 820–830. <https://doi.org/10.1111/ijn.12347>.