InnoVationinfo Journal of Pediatrics and Infants

ISSN: 2581-7493
Volume 4: 2
J Pediat Infants 2021

Problem-based Learning and Blended Learning in Critical Care Education in Nursing Students

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Abstract

Background: In recent times, numerous novel teaching methods have been developed for use in medical education. Of these methods, problem-based learning (PBL) and blended learning have attracted the most attention. The objectives of the present study were to identify the competencies in clinical practice in critical care and to evaluate the b-learning process of nursing students through PBL.

Methods: A mixed-methods study was conducted. Quantitative data (sociodemographic and forum variables), was collected from a self-reported questionnaire (48 questions), classified into 4 domains: learning, tutoring, satisfaction, and self-evaluation. In addition, qualitative data was informed by PBL through a virtual forum, and final seminar classroom face-to-face, in the fifty-one nursing students from fourth-year undergraduate.

Results: According to the findings, the mean age of nursing students' (21.18±2.19) years, and 70, 6% of students were women (n=36). In the qualitative analysis of the forums, 6main categories were extracted: the humanization of care (n=93), communication (n=69), learning (n=92), professional knowledge (n=55), clinical safety (n=66), complexity (n=101). The analysis of the ad hoc questionnaire obtained significant differences ($p<0.001$) in the scores about tutoring and self-evaluation about the virtual forum.

Conclusion: The dynamized forum allows accompanying the students while their clinical practice in critically ill patients in their learning process to develop critical thinking. It's also a useful tool for achieving results, in scenarios that have become the result of social confinements, which will lead to a paradigm change in universal education.

Keywords: Problem-based learning, Students, Nursing, Critical care nursing, Nursing faculty practice, Nursing education research, Self-evaluation.

Abbreviations

Virtual Learning Environment (VLE); Information and Communication Techniques (ICT).

Article Information

Article Type: Research

Article Number: JPI-146

Received Date: 21 July, 2021

Accepted Date: 05 November, 2021

Published Date: 12 November, 2021

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Citation: Gil-Mateu E, Barceló-Prats J, Albacar-Riboó N, Casanovas-Garrigós G, Reverté-Villarroya S (2021) Problem-based Learning and Blended Learning in Critical Care Education in Nursing Students. J Pediat Infants Vol: 4, Issu: 2 (97-105).

Introduction

Curriculum model and education strategies

Clinical practicum occupies a prominent place in the student's academic curriculum. The nursing curriculum must improve the knowledge, skills, and communication of students to achieve the specific contextual competencies of practice [1-3]. In addition, innovation in the collection and revision of the curriculum is one of the main requirements of the current era in medical science education.

Graduates Competencies

In Europe, the evaluation of nursing students is focused during clinical practice commonly on clinical competence in nursing, communication, ethical decision-making, collaboration, and critical thinking. However, in Catalonia, Spain, the nursing degree education model is based on 4 basic principles: personalized attention, academic training, cooperation, and interaction that provide more critical and experiential learning. This link, with professional support and flexibility in the organization of learning, contributes to training throughout life [4,5].

Thus, the clinical practicum of nursing students constitutes the transfer of theoretical and methodological knowledge learning to the practical application [5]. To be able to perform this transfer, one of the main players is the clinical tutor, who must guide the constructive mental activity of the students. The academic tutor will provide core-competences of basic sciences (B.Sc.) nursing graduates, which will promote autonomous understanding and performance by the students [6]. The six principal competencies of B.Sc. Nurse graduate: (1) professional values, attitudes, behaviors, and ethics of caring, (2) the scientific foundations of the biological, human, and social sciences, (3) social, critical, logical, and creative thinking, (4) information and knowledge management, (5) clinical communication and relationship skills and (6) clinical procedural skills.

Assessment Methods especially in the clinical practice

Currently one of the challenges of university teaching is to promote student participation. Learning according to Silva and Maturana [7] is generated when the student is actively involved in the process, building meaning, and developing proposals based on the collaboration of the teachers and their peers. You learn when generating contexts that propel the student to guide this process from a deeper approach, that is, to approach a certain task in a meaningful way beyond just a qualification [7]. Several authors have coincided on the need to acquire reflection on action and reflective journals as basic tools to develop critical thinking, it is necessary to transit from a teacher-centered to a student-centered education [7-12]. Achieving this deep learning needs the teacher to value and plan their methods considering this transformation [9].

Moodle facilitates a student-centered virtual learning environment (VLE). It allows the incorporation of computerized information and communication techniques (ICT), and the use of active methodologies [8]. Its use has increased in teaching to introduce electronic learning (e-learning) modalities or models that combine face-to-face with virtual learning: a blended learning (b-learning) model [6,9,13].

Nowadays the importance of e-learning is no longer questioned as students belong to a generation that understands ICT as part of their usual environment and takes advantage of the use of mobile devices. Students live in a culture of interaction and their communicative paradigm is based on interactivity [7,14,15]. Education, as well as organizations, must innovate and make continuous improvements tailored to the needs of a changing syllabus, with continuous training in the virtual learning environment [8,16-18].

Quality Improvement, Monitoring, and Evaluation

Voutilainen et al. that question the efficacity of a virtualized model [19]. That is the reason why we have mixed models: b-learning, a way to learn that combines the online methods with the face-to-face ones. In between them, we find flipped learning: It is a pedagogical model based on transferring work from outside the classroom (clinical practices) to inside it. We also have collaboration learning, that learning that works with teams. And, as a third method, there is the learning based on competencies, where the student must show the results and control of the capacities in his discipline. All of these develop activities that benefit the practical work, in teams and are linked to concrete situations [17,20].

The kind of student, contents, ubication of the participants in the process, and the available electronic media are the factors that determine the model that must be put into practice. But, in all of them, it's very important to create a learning community: a place to build knowledge, where students and tutors can interact.

So, to reach the skills, but also to reduce the stress, the classes for the nursing students, need to help them with reflexion and critical thinking. Based on the affirmation from Alfaro-Lefevre it isn't a method to be learned, but a changing process, that needs skills, knowledge, and some attitudes or dispositions; it is contextual, has a target, and looks for self-improvement [21,22].

In the forums, the tutor is the reference for the student, which guarantees that the course continues. He supports every participant in his training process and helps them overcoming obstacles and reaching their expectations. The virtual tutor offers support, encourages, orientates, and follows the learning process of each one in the online training activities. So, the tutor should develop the academic, pedagogical, and orientation work. And he needs to be a moderator, motivator, and helper in the training process [23].

Therefore, it appears that VLE allows students to participate in their learning online and between peers improving their competencies. For this reason, there is currently a need to explore the methodologies that help develop skills and knowledge for the students using the ITC.

Purpose: the objectives of the present study were to identify the competencies in clinical practice in critical care, and to evaluate the b-learning process of nursing students through PBL.

Materials and Methods

A mixed-methods study was conducted. A qualitative descriptive methodology informed by the virtual forum and quantitative descriptive method from a self-reported questionnaire.

Purposive sampling of nursing students of clinical practice in critical care units from final-year undergraduate in Rovira Virgili University (URV), Catalonia, Spain. A total of 51 nursing students from URV at the Department of Nursing, participated in this study, divided into four training cycles. We excluded nursing students enrolled in other courses of degree or other clinical practices, for example, mental health units, geriatric units, or special units. Data were collected from January to June 2019.

Data sources included a virtual forum during four or five weeks and a final classroom seminar face-to-face. The flipped learning methodology was applied in this seminar. The students reviewed the material forum before class with classroom time then being used to deepen understanding through discussion with peers and problem-solving activities. The forum was carried out using a guide developed by the research team and nursing students were kept informed.

The basis of the model is the forum. This resource is offered by the Moodle platform, and it is the place where knowledge and experiences are gathered, so it is the active element of the model.

At the end of the cycle, the students attended the seminar conducted by tutors, they worked and reviewed all the shared information generated in the environment of the dynamic forum. Each student gave a code to his/her contributions to the Forum and in small groups of 3-4 students gathered the codes in subjects (categories) and subtopics (subcategories) [24].

The students contrasted the information with the tutor. They synthesized and prepared a presentation for the rest of the groups through conceptual mapping [25]. Finally, all the groups presented and shared the information they have developed. They discussed and debated among groups, and when it was finished, the tutor collected the material generated.

Participants completed a brief ad-hoc questionnaire (48 questions) which included sociodemographic and forum variables. The ad-hoc questionnaire evaluated learning, tutoring, virtual forum self-evaluation, and satisfaction with Likert scores from 1 “strongly disagree”; 2 “disagree”; 3 “agree” to 4 “strongly agree”.This instrument was adopted from [26-28].

Ethics

The study obtained approval from the Ethics Committee *InstitutInvestigació Sanitaria Pere Virgili* (Code 121/2020), the Department of Education, and participants provided their consent. The investigation was developed following the guidelines of the Helsinki Declaration [29].

Qualitative analysis

The data were managed using Weft-QDA free software and analyzed using content analysis [30]. A detailed reading of the forums was performed, and the texts were encoded with signification units; the codes are regrouped with a wider level of meaning: subcategories. Moreover, these, at the same time, are grouped into categories that represent the topics of the discourse. In short, the codes, categories, and subcategories provide the structuring of the discourse and, to validate the research, the information is analyzed by the students in the seminars.

Statistical analysis

All data obtained from the questionnaire were analyzed using SPSS version 26.0 (Statistical software, IBM Corp., Armonk, NY, USA). The significance level was established by $p<0.05$. A descriptive statistic of sociodemographic characteristics was carried out, followed by the mean and the standard deviation of the 4 groups. The normal distribution of the data was evaluated using to Shapiro-Wilk Normality Test. The Anova was used to compare the 4 groups the correlations existing within the satisfaction variables (intergroup analysis).

Results

It was observed that 70.6% of students were women (n.36) with an average age of 21.18 years (standard deviation 2,186).

In the qualitative analysis of the forums, six main categories were extracted (Table 1): The humanization of care (n=93) including two subcategories, professional relationship with the patient and with family (n=65) and holistic care (n=28). In communication (n=69) two subcategories are identified: communication skills (n=35) and the experiences existing in communication (n=34). The third category, learning (n =92) is divided into lack of preparation (n=57) and the practice unit where they develop their learning (n=35). Professional knowledge (n=55) is presented as the fourth category with a single sub-category, skills, and knowledge (n=55). Clinical Safety (n=66) was the fifth category, there were two subcategories concerning the professional (n=32) and with the infrastructure (n=34). Finally, the complexity (n=101) is divided into professional performance complexity (n=54) and the complexity of the urgent care system (n=47).

The analysis of the questionnaire shows that the items that have presented significant differences ($p<0.05$) are six (4, 22, 30, 44, 46) and by ($p<0.01$) item 34 (Table 2). About the evaluated learning, tutoring, self-evaluation about virtual forum and satisfaction: item 4 ($p=0.041$) obtained differences between the groups, they agree on the approach of clear and specific objectives of the forum. Items 22 ($p=0.025$) and 30 ($p=0.021$) are noted that students refer to good scores with the activities proposed by the tutor to develop collaborative learning and that the tutor performs a synthesis of the interventions. In item 44 ($p=0.035$) related to satisfaction, differences were observed between the groups, indicating

Meaning	Category	Sub-categories	Examples of data reported
The actions that give value to the dignity and individuality of the person, from a comprehensive approach, where they interact in the biological, psychological, social and spiritual dimensions.	Humanization Cures (N=93)	The patient-family relationship (N=65)	“It is very important for the family to be integrated to maintain a good treatment, especially in emergencies. This is a situation that causes a mix of emotions.” (G1). “Emphasize the importance that nursing has with relation to the patient and relatives with emergencies, because many times they do not know what is happening.” (G4). "When a patient is treated in the hallway and they have to spend many hours there, intimacy is limited.” (G2)
		Holistic Care (N=28)	“The individual cannot be fragmented into two parts and, moreover, in such delicate situations as those of a patient in a critical state, it is essential to recover a global and bio-psycho-social vision. " (G1). “Almost all patients who attend emergencies have pain and the most important thing is to alleviate this pain to make them comfortable.”(G3).
Through the communication process, human beings share information, being an essential activity for life in society. It includes the factors that are necessary for good communication.	Communication (N=69).	Communication skills (N=35).	"I think that empathizing is very important in nursing. Putting yourself in the shoes of the patient and family will often help in handling the situation." (G2) “The issue of communication and establishing a therapeutic relationship with the family is very important because "not knowing" and the uncertain future creates a lot of anxiety.” (G1)
		Experiences in communication (N=34)	“Many times, the procedure to be performed is not explained and the patients are restless and scared.” (G2) “I think in my unit, communication with the patients' families, is quite correct and adequate since the people of this unit have been trained for it.” (G4) “The emotions of a death in our profession, I think, are very difficult to manage, and especially communicating with the family, for me, is very hard.” (G1)
Process of acquiring knowledge, skills, values and attitudes, possibility through study, teaching or experience.	Learning (N=92)	Lack of preparation (N=57)	“The first week was one of the worst weeks to remember in the four years of practice [...] I felt very lost with a lack of knowledge “(G4) “During the beginning of my cycle, I have been unsure because on many occasions I have not known how to act." (G2)
		Practice unit (N=35)	“A short, enriching and very beautiful stage. [...] To say that they have been the best practices that I most liked, a unit where [...] You do not only have good knowledge and techniques but you have to be very present and take great care of the person and their family. " G1
Ability to implement knowledge, skills and attitudes of the nursing profession, serving the resolution and prevention of a health problem.	Professional knowledge (N=55)	Skills and knowledge (N=55)	“The skills and knowledge of the nursing staff in these services are knowing what to do at every moment of the emergency is a complicated work. " (G2) High competence level; no only at the welfare level but also teamwork and adaptation to a changing environment as well.” (G3) “I think it takes experience to develop the critical eye and know what is the gravity level of patient in such a short time." (G4)
The prevention of injuries to the patient or of adverse effects as a consequence of the care processes. It is a dimension of quality in health care.	Clinical safety. (N= 66)	In relation to professional (N=32)	“I think that anyone can make a mistake, but it shouldn't lead to consequences as fatal as death.” (G2). “More use of gloves and more asepsis when using plugs in serum therapy equipment where they are not being used." (G2)
		In relation to infrastructure (N=34)	"The lack of stretchers or places to care for the patients.” (G2) “Working under stress and in poor standards also affects the patients.” (G4)

Difficult situations to be solved being composed of many aspects and to present a problem, which is characterized by the difficulty of resolution.	Complexity (N=101)	Personal performance complexity (N=54)	"One of the most complicated patients to take care of is one where you have to monitor their vital signs and their condition constantly, in order them deteriorating." (G1) "The speed in which care is done is not the same" (G1) "It is essential to know how to prioritize care […] a person's life depends on it. As a nurse you must have standards." (G3)
		Complexity of the urgent care system (N=47)	"In a range of critical situations with people suffering from cardiac arrest, it isa very difficult and complex situation to study at the time." (G4) "Emergencies is an intense and complex service where you learn new things every day." (G1)
G1: participants forum group 1; G2: participants forum group 2; G3: participants forum group 3 and G4: participants forum group 4			

Table 1: Virtual data qualitative analysis forum.

Questions (n=48)	Mean (SD)	Lower limit –Upper Limit (IC 95%)	p-value
In relation to the virtual learning environment and the debate forum			
1. The didactic material has clearly explained the operation of the virtual learning space where the tutoring discussion forum is located.	3.27 (0.53)	[3.12-3.42]	0.256
2. There are materials and/or guides that contain information about the formation of objectives, content, activities to develop and evaluation.	3.28 (0.60)	[3.11-3.45]	0.549
3. The presentation has indicated the technical prerequisites.	3.27 (0.56)	[3.11-3.43]	0.504
4. The goals have been explicit and realistic.	3.37 (0.56)	[3.21-3.52]	0.041
5. There is a chronogram.	3.58 (0.64)	[3.40-3.76]	0.257
6. The supervised debate forum allows sharing ideas and knowledge.	3.38 (0.80)	[3.15-3.61]	0.097
7. The virtual space of learning Moodle (has been an easy to use environment).	3.45 (0.61)	[3.28-3.62]	0.743
8. I have felt comfortable using space.	3.39 (0.66)	[3.20-3.58]	0.300
9. The forum organisation has allowed you to organize your time in a flexibly way.	3.00 (0.69)	[2.81-3.19]	0.246
10. The subjects of the forum have been topical and of academic interest.	3.22 (0.75)	[3.00-3.43]	0.098
11. Virtual resources (URLS, etc.) have been relevant for the learning process.	2.67 (0.73)	[2.46-2.87]	0.379
12. The contents have justified to the objectives set.	3.02 (0.64)	[2.84-3.20]	0.334
13. The topics dealt with in the debate forum presented a common thread and they have related to each other.	3.33 (0.76)	[3.12-3.55]	0.056
14. I have felt comfortable using the discussion forum.	3.12 (0.90)	[2.86-3.37]	0.150
15. Access to external links has been viable from any device.	3.10 (0.75)	[2.89-3.31]	0.669
16. The information provided in the virtual space has been useful to me for my correct development	2.90 (0.70)	[2.70-3.10]	0.666
In relation to the Forum's motivational tutor			
17. The tutor indicates how to contact him/her.	3.61 (0.53)	[3.46-3.76]	0.704
18. The tutor made me feel good.	3.67 (0.47)	[3.53-3.80]	0.270
19. I have established a trust relationship with my tutor.	3.37 (0.72)	[3.17-3.58]	0.338
20. The frequency of interaction with the tutor has been as frequent as I have needed.	3.35 (0.55)	[3.20-3.51]	0.950
21. The tutor took account of consolidation strategies and knowledge transfer.	3.14 (0.66)	[2.95-3.32]	0.054
22. The tutor has proposed activities to develop collaborative learning.	3.20 (0.72)	[2.99-3.40]	0.025*
23. The tutor has facilitated terminology or query sources.	2.80 (0.80)	[2.58-3.03]	0.404
24. The tutor has proposed the co-evaluation among the students.	3.02 (0.78)	[2.80-3.24]	0.466
25. The tutor has detailed the criteria of each activity.	3.29 (0.57)	[2.81-3.13]	0.493
26. The tutor has clearly described the methodology and the time of delivery of the evaluation activities.	3.43 (0.60)	[3.26-3.60]	0.279
27. Tutor sent clear and short messages.	3.65 (0.52)	[3.50-3.79]	0.151
28. The tutor has used a language adapted to the forum and is understandable.	3.75 (0.52)	[3.60-3.89]	0.265
29. The tutor has redirected dialogues in the forum, reformulating or deepening the interventions.	3.31 (0.70)	[3.11-3.51]	0.657
30. The tutor has carried out interventions as a synthesis discussion in the forum.	3.20 (0.77)	[2.98-3.41]	0.021*
31. The tutor provided individual retroactions to the discussion forum.	2.65 (0.86)	[2.40-2.89]	0.647
32. In case of doubts posed in the forum, the tutor has answered.	3.02 (0.78)	[2.80-3.24]	0.088
33. The tutor has motivated the common spaces of communication.	3.22 (0.61)	[3.04-3.39]	0.183
34. The discussions proposed by the lecturer to the Forum have been aimed at achieving goals.	3.20 (0.66)	[3.01-3.38]	0.000**

35. With the discussion forum motivated by the tutor, the quality of the practices has improved.	2.98 (0.78)	[2.76-3.20]	0.074
In relation to the satisfaction			
36. Tutoring programs are essential for a proper development of practices.	3.31 (0.73)	[3.11-3.52]	0.286
37. I am satisfied with the quality of the support received from the tutor.	3.43 (0.60)	[3.26-3.60]	0.110
38. I am satisfied with my participation in the tutoring program.	3.29 (0.72)	[3.09-3.50]	0.475
39. The work done in the forum has helped me to confront the demands of the professional world.	2.75 (0.74)	[2.54-2.95]	0.247
40. The work done in the forum has greatly influenced my motivation.	2.84 (0.85)	[2.60-3.08]	0.452
41. The work done has influenced me to increase my degree of personal safety.	2.90 (0.85)	[2.66-3.14]	0.228
42. The work done in the forum has helped increase my competence level.	2.76 (0.79)	[2.54-2.99]	0.420
43. The work done in the forum has helped to reduce the level of stress produced in the training	2.29 (0.90)	[2.04-2.55]	0.628
44. Indicate your assessment of the discussion forum dynamized as support of your clinical practices.	2.84 (0.78)	[2.62-3.06]	0.035*
45. In general, what degree of satisfaction have you had regarding learning?	3.18 (0.72)	[2.98-3.38]	0.444
Self-evaluation			
46. Do you think you have achieved the objectives of the course?	3.45 (0.54)	[3.30-3.60]	0.014*
47. Do you think you have achieved your expectations?	3.37 (0.59)	[3.20-3.54]	0.128
48. The duration of the training has allowed you to achieve the objectives.	2.76 (0.81)	[2.54-2.99]	0.208
Variables are presented as Mean ± standard deviation (SD) and Anova test is used to assess differences between groups. *p<0.05** p<0.01. Own ad-hoc and virtual questionnaire for Moodle.			

Table 2: Satisfaction scores related to virtual learning environmental, debate forum, forum's tutor motivation, global satisfaction, and self-evaluation.

that the forum accompanies clinical practices. Item 46 (p=0.014) of the self-assessment, presented the best score with a narrow interval indicating that the objectives of the subject were well thought out. Item 34 (p<0.001) showed that the forum discussions guide achieving the objectives. Finally, items 13 and 21 although not significant show a tendency to positively assess the relationship between objectives and content, as well as interaction with the tutor.

Discussion

Based on Alfaro Le-Fevretheory, critical thinking has to be a key ingredient in professional training and part of the job of educators is to work to create openness in a culture where critical thinking has to be an integral part of the workshop [21,22,31]. The reality is the moment when the student arrives in a professional situation and faces intense life experience, related to disease, pain, suffering, and death of patients and their relatives. In addition, students must react to requirements coming from the institutional environment and a high number of patients, and the complexity of critical services. These negative and positive experiences Bonfill et al show the impact on their personality [32].

The practical training resembles very much, a work environment. Therefore, the implementation of educational strategies searching for critical thinking is highly recommended to make a good transition from the academic to the professional world [33].

Care humanization

The students have been thinking of nursing as a therapeutic relationship, a skill that sometimes has not been associated with the practice. They debate about critical service humanization, observing deficiencies in emergencies, and contrasting them with the ones in intensive care units, where it seems that humanization has been incorporated [34].They describe emergencies as a space shared by professionals and patients, with trolleys from patients piling up everywhere in the corridors, depersonalized places without privacy conditions, where patients often stay twenty-four hours. In that context, the respect for intimacy, people's autonomy, the gestions of emotions, the spirituality, and the importance of proper communication between patient and professional, are very difficult to apply, due to the physical conditions, the rapid interventions, and the urgency of the situation [35-37].

Communication

In the context of emergency services, the relation with the family appears as an aspect to be improved. Cohesion and communication from the health team are determining, and it's stated that to help with patient's autonomy, it is necessary to work with communications skills, such as empathy, therapeutic relation, and active listening. There are studies that show greater communication skills, and less emotional exhaustion and depersonalization in the professionals of the intensive medicine units, compared to the emergency services [38,39]. Communication experiences experienced by the students show difficulties in applying those skills. For them, that emotional complexity and the gestion of bad news, appear as an important communication barrier in their professional future.

Clinical safety

Our results show the risk of incorrect patient identification, the lack of procedural understanding, and the deficiency of resources in certain moments, personnel, and infrastructure. They are aspects related to the ones that Mourementions in his study, where he was showing the emotional impact of the professionals when they make a mistake [40]. What is of concern to the students, that impact has been identified with the worry for the mistakes and bad practice, where the complexity of the services (decision

making, actuation speed, priority, and prevention) appears as another difficulty in their practice.

Learning, professional knowledge, and complexity

The students debate the importance to apply critical thinking in front of a service that has been defined as complex. Knowledge, nursing competencies, techniques, professional experience, actuation efficiency, and main teamwork, have been presented in the forum, as the necessary factors to carry on with the care of the critical patient in complex units. Jiménez and Montero state that knowledge in critical patient care demands specific training, effective and efficient competencies. They define the emergency care system as complex, due to the fact that it is multidisciplinary, it has a hierarchical dependency, its patients are acute, it demands continuous availability, it concerns the whole population and its care is transversal [41].

Students recognize a set of procedures, in the actuations of the unit professionals: Theorical, practical and experience. They realize about the need of a theorical and specific training base, they show a lack of knowledge although they are satisfied with the level of learning that has been reached. Basically, they are afraid to confront practice with the reality of their knowledge. Zuriguel was also showing in his thesis, that intensive care nurses have a higher level of critical thinking, confirming that this skill is contextual [33].

On the other hand, Uriarte, Ponce &Bernal stress that knowledge that the student acquires in clinical spaces, reflects a repetitive, mechanical, and cyclic practice. This doesn't allow those students to reflect about a change in the practice, so that limits their professional development, precisely when the students need greater help and assessment. They say that reflexion and critical thinking are not innate, but they are skills gained by specific learning, ability to adapt and practice [42]. The forum appears as this necessary space for the students, where they can think about their experiences.

Forum satisfaction

Forums with small groups have become a place to share and debate experiences in between colleagues.It is a space to contribute, with a deep reflexion, about the experiences, as the described categories show, allowing that university education to train competent, critical, creative, and thoughtful students.

The general results of the questionnaire give evidence that there is a tendency to a high level of satisfaction in the forum. In agreement with the results from other studies, forum and virtual space have been satisfactorily valued by the students [23]. One can point out that there are some points of disagreement in between groups, concerning the tutor and the perception of the debate contents. These differences lead to thinking that thestudents' motivation is crucial for the tool to be correctly used, and to achieve the goal. Buil et al. say that social motivations like the wish to share knowledge and altruism, personal motivations like the recognition of colleagues and teacher, and technological motivations like the use and facility of the platform, develop a key role for the success of the discussion forums [43].

Regarding the tutor, there are some points that could be improved: To help with a collaboration learning, to contribute with more reference sources, to make individual feedback and to synthesize the contents. Literature [44] has already put in evidence that one of the greater challenges for teachers proposing a forum, is to encourage the participants and to keep them motivated, giving importance to create ambiences where students can be stimulated.

This motivation comes when what is wanted to debate becomes relevant, proposing friendly and challenging spaces, that create conceptual discussions or cognitive imbalances, so the participant looks for knowledge [45]. So, it is important to highlight the tutor's role as a person that encourages the platform and creates a secure space. Therefore, the forum becomes a professional and personal grow factor. The fact that it is organized in small groups, helps with the encouragement and motivation of the students to share their experiences.

So, we observe that the implementation of a virtual space with easy access and without timing restrictions, in small groups, where one can share and expose situations associated to the debate, impacts in the accompaniment, and personalizes thesupervision of the nursing students in their clinical training. Chang's study, in between other revised strategies to work in critical thinking, concludes that the forum is a space that allows interacting with a professional. The tutor that is constantly with them in this learning process gives security, encouraging reflexion and growing the student [46]. Here is a space to recognize and learn from previous experiences, being a call to the practice which makes you believe and think about the situations.

Finally, the combination of the dynamized forum with the last seminar, becomes a virtual assistance model, an ICT resource for the interchange of knowledge in between the participants, an educational strategy to incentivise critical thinking in the world of clinical practices which occupies an important part of the academical curriculum, where students often feel alone and do not perceive belonging to a group. The model has helped the student to reach three of the six axis that incorporate the learning results in the clinical training: Axis 1 – Professional values, attitudes, behaviours, and caring ethics; axis 3 – critical, social, logical, and creative thinking; and axis 4 – information and knowledge management. The model has some points to be improved in the role of the motivational tutor, to reach the enthusiasm of the group, facilitating cooperation and collaboration in the learning process. Here we have a tool with great potential, in front of scenarios arising with lock down situations that will provoke a change in the universal teaching model.

Study Limitations

The study is aimed at senior nursing students, which may limit the transfer of results. Although both men and women have been included, the female sex predominates, an aspect that may have influenced the characteristics of interventions. Finally, future studies are needed that can apply the same method in other practice subjects, to be able to compare the level of depth and management of b-learning and to study

the impact of the accompanying model in the reduction of secondary stress in clinical practice.

Conclusion

Using techniques such as the dynamic forum to strengthen the use of mixed methods is a good starting point for encouraging nursing students to develop critical thinking; it inspires them to generate reflection, analysis, and criticism. However, it is necessary to inform them by properly participating in the forum, so they know that it has a clear and defined objective within the learning process.

Therefore, the forum model is a tool for students to be actively interested in the learning process and not just as passive participants. It is a reflective, pragmatic, and active space. It becomes a student-centered virtual learning environment, where they can share knowledge, favoring collaborative learning and between peers. Finally, in the context of critical patient practice, the forum is an intervention to help students achieve learning outcomes (axis 1, 3, and 4).

Acknowledgment

The students of the Universitat Rovira Virgili who have participated in the study.

Authors' Contributions

EG, SR, NA collected data, EG, SR, NA and GC performed the analyses and literature search, and drafted the text as thesis. SR conceptualized and designed the study. EG, GC coordinated, supervised and analyzed the data, and assisted in final write-up of the manuscript. EG, SR, NA and GC participated in conceptualizing and interpretation, and provided critical review of drafts. Then all read and approved the final manuscript.

Availability of Data and Materials

The raw data supporting the findings presented in this study will be available from the corresponding author upon request.

Ethics Approval and Consent to Participate

The study obtained approval from the Ethics Committee *Institut Investigació Sanitaria Pere Virgili* (Code 121/2020), the Department of Education, and participants provided their consent. The investigation was developed in accordance with the Declaration of Helsinki (World Medical Association, 2013), that their participation was voluntary and that they could withdraw their participation at any time without any negative consequences or risk. The participants were also informed both orally and in writing about the aim of the study before they gave their consent to participate. *All participants provided informed consent.*

Consent for Publication

Not applicable.

Competing Interests

The authors declare that they have no competing interests.

Funding

None

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Citation: Gil-Mateu E, Barceló-Prats J, Albacar-Riboó N, Casanovas-Garrigós G, Reverté-Villarroya S (2021) Problem-based Learning and Blended Learning in Critical Care Education in Nursing Students. J Pediat Infants Vol: 4, Issu: 2 (97-105).