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Original research

Practice and effectiveness of "nursing case-based learning" course on nursing student's critical thinking ability: A comparative study

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ABSTRACT

Background: Case-based Learning was an effective and highly efficient teaching approach that was extensively applied in education systems across a variety of countries. Critical thinking ability is an important indicator for access the study ability for baccalaureate nursing education.
Objectives: The study aimed to explore the effect of "nursing case-based learning" course on the critical thinking ability of nursing student.
Participants: A total of 80 students who were in Junior were included in this study. The experimental group included 40 students who selected "nursing case-based learning" course. The control group included 40 students who selected the traditional teaching course.
Methods: The critical thinking disposition inventory (CTDI-CV) was used to evaluate the effects of the critical thinking abilities during the 1st week (pre-test), the 9th week (mid-test), and the 18th week (post-test).
Results: There are no statistically significant differences between two groups in the pre-test thinking abilities ($P > 0.05$). After nine weeks, the critical thinking abilities of experimental group were significantly higher than control group ($P < 0.05$). Three obtained time-points had statistically significant differences of control and experimental group ($P < 0.05$).
Conclusion: The "nursing case-based learning" was an effective course to develop the critical thinking abilities of nursing students. Strict instructional design was the guarantee for the smooth implementation of "nursing case-based learning" course.

1. Introduction

University nursing education is to convey theoretical knowledge and cultivate the abilities of students to critically analyze evidence, thus reaching optimal care decisions when faced with complicated clinical issues (Ward and Morris, 2016; Raymond et al., 2018). Scheffer and Rubenfeld (2000) stated that, critical thinking ability in nursing include analyzing, applying standards, discriminating, information seeking, logical reasoning, predicting, and transforming knowledge. For decades, critical thinking has been developing as a flourishing concept throughout nursing education and practice (Kaddoura, 2013; Sommers, 2018). Researchers agree that the ever-increasing complexity of modern health care requires registered nurses to possess high level critical thinking skills (Lasater, 2011; Perez et al., 2015). A nurse's critical thinking ability can ensure a safe environment for the patients by identifying the priorities and setting them in motion (Levettjones et al., 2010; UrcolaPardo et al., 2017). Therefore, developing the critical thinking ability of nursing students is one of the essential learning objectives for any clinical nursing course.

Case - based learning (CBL) is a long established pedagogic concept that has been widely implemented throughout various disciplines. Mclean (2016) defined CBL as a tool that involves matching clinical cases in health care-related fields to a body of knowledge in that field, to improve clinical performance, attitudes, or teamwork. In nursing education, CBL is considered to be a participatory teaching-learning method that facilitates active and reflective learning in students to develop critical thinking and effective problem solving skills (Azizi-Fini et al., 2015). In implementing CBL, a lecturer can utilize various approaches to introduce simulated cases into a class, such as a guided inquiry, case seminars, role plays, and simulated patient care (Thistlethwaite et al., 2012). The application of CBL in teaching can realize various learning outcomes (Macho-Stadler and Elejalde-Garcia, 2013). Students can acquire adequate knowledge about patient care by accessing real cases. They can obtain a better understanding of various

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individual perspectives, which is useful for the development of their mindset for cooperation and continuous knowledge development (Forsgren et al., 2014). This also provides better opportunities for students to improve their patient assessment skills as well as their nursing care experience (Braeckman et al., 2014). Given these benefits, CBL has widely been adopted in nursing education in many countries to develop the critical thinking abilities of nursing students (Yoo and Park, 2014; Chan et al., 2016).

The main challenge for the implementation of CBL is a lack of suitable nursing cases. In China, the available nursing cases published in the authoritative textbooks typically contain a single episode that solely focuses on the disease. Rarely are other introduced conditions such as psychosocial issues. This lags behind the advancement in modern nursing care, which not only focuses on the disease, but also on the value of a patient's spiritual needs (Baldacchino, 2006). Such simplicity is the key weakness of this particular style of presenting cases because it only shows one aspect of the clinical nursing practice, and lacks information about each patient's illness journey as well as the holistic nursing care process (Kopp et al., 2014). Unlike standard textbook descriptions, the problems of patients that nurses encounter are often ill-structured, thus challenging students' ability to identify, analyze, judge, and link theory with practice for a successful problem solving (Jonassen and Rohrermurphy, 1999; Kapur and Kinzer, 2007). Therefore, nursing educators need to present the adequate context to students to enable them to experience a real world example, and to ultimately help them to develop critical thinking and problem solving abilities particularly required for such a situation, which gradually prepares them to cope with complicated patient problems in their future career.

In recent years, an increasing number of researchers were exploring beneficial to apply multi-episode nursing cases teaching method (Cong et al., 2013; Hong and Yu, 2016). Hong and Yu (2016) study showed that multiple cases had an enhanced effect on the ability of critical thinking. This is due to the fact that this type of nursing case is more closely related to a real world nursing scenario (Bagdasarov et al., 2013). In the health care field, critical thinking is often put into the context of clinical reasoning or judgment as it relates to the health care for a patient (Catherine et al., 2016; Lighthall et al., 2016). Critical thinking differs from clinical reasoning in that it is more general and can be applied to a variety of settings. Students are “immersed” in or “infused” with a clinical context (or reasoning) of their profession and explicitly taught how to think critically in the specific context (Abrami et al., 2008).Nursing work-oriented case learning is a form of multiple cases, which focuses on student's “learning” to align the students' learning process with nursing work. Nursing work-oriented case learning provides a platform from which students can learn to apply their clinical-reasoning skills. Teaching strategies that foster critical-thinking skills, specifically reasoning skills, which are deliberative, reflective, analytical, and procedural are associated with the development of reflective problem-solving and critical-thinking skills (Catherine, et al., 2016). During the process of course construction we designed and implemented an experiment to evaluate the effectiveness of “nursing case-based learning” course in facilitating student critical-thinking ability. The following is a description of the experiment that was conducted including the subjects that were recruited, the techniques that were used to improve their learning, the methods that were utilized to measure the effectiveness of the teaching strategies employed and the results of the “nursing case-based learning” course efficacy experiment.

2. Subjects and methods

2.1. Design

Considering effect of “nursing case-based learning” course on nursing students in the short and long term, the present study was conducted as a quasi-experimental, double group, pretest-mid test-posttest design.

2.2. Subjects

The study used a cluster sampling to select 80 nursing student from the graduating class of 2014 at the Huzhou University, Zhejiang Province in China. 40 students were attending the elective “nursing case-based learning” course, which were included in the experimental group; Another 40 students were not attending the elective “nursing case-based learning” course, which were included in the control group. The participant was junior. They had completed relevant common and basic nursing courses and had the ability to understand the context in the study.

2.3. Ethical considerations

Ethical approval was obtained from the Nursing Institutional Review Committee of the Medicine College of the Huzhou Normal University. The students were voluntarily and completed the written consent. The students were free to withdraw from the study at any time and without any adverse effect on their graduation course.

2.4. Content of course

Course development forms the basis of constructivist learning theory. The theory emphasizes initiative, practice, creativity, and sociality of students in process learning (Jonasse and Rohrermurphy, 1999). Our study were organically based on the tasks encountered during the clinical working, communication, and collaboration, patient social or background support, and other issues. To complete the course objectives, the aim was to design a series close to the clinical nurses' work processes practice of multiple cases and clinical nursing problems in the form of group cooperation via a combination of multiple teaching methods.

According to Kim et al. (2006), the key elements that need to be considered in the design of a medical teaching case include relevant, realistic, engaging, challenging, and instructional information. Following this guideline, we reviewed nursing records from a general hospital and carefully selected those as the original material that were representative of the sequence of a patient's illness journey. We edited the original patient reports and provided the framework formed the “admission care, inpatient care, discharges care”(Fig. 1). The case stories and questions were designed according to the holistic care model, using the steps of the nursing procedure to think about the case problem. It displayed various aspects of the longitudinal development of a patient's condition from admission to discharge including the disease history and clinical appearance, the treatment and care plans, and the associated social, mental, and psychological situations. We attempted to describe the case story as accurately and vividly as possible to engage the students and to achieve that they could experience the process of holistic nursing care. We designed 8 nursing cases for this subject. These covered the essential content for the nursing care in medical nursing, surgical nursing, gynecological nursing, and pediatric nursing (Table 1).

2.5. Teaching organization

Students in the control group were taught with conventional teaching methods. Students in the experimental were attending the elective “nursing case-based learning” course. These teaching methods process activities included:

(1) Group and case allocation. Firstly, we used the random lottery method to divide the students into four groups of 10 people each. Secondly, after the end of each lesson, each group leader extracted the name of each group from an ‘ABCD’, teacher A guide group A and group B, teacher B guide group C and group D, and all the groups completed the case. Finally, before each case study course,

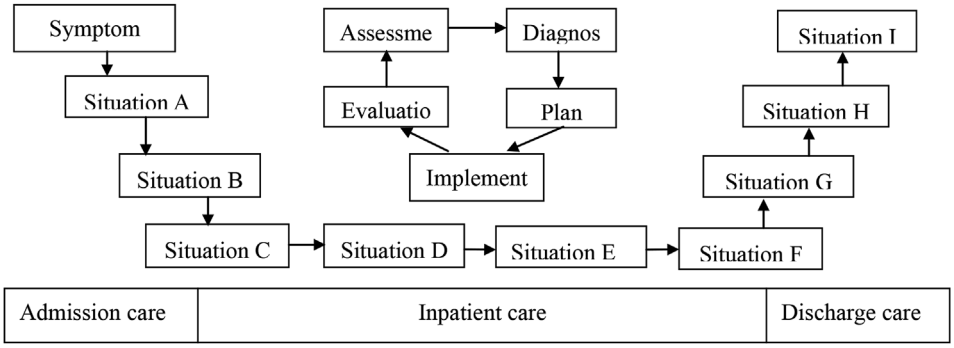

Fig. 1. Case design framework.

Table 1
Content modules of the nursing course, imported with symptoms.

Ordinal	Experimental group	Class time	Classes weekly
1	Training for teaching and learning	First	First
2	Cough and expectoration	Second	Second
3	Thoracodynia	Third	Third
4	Polyuria	Fourth	Fourth
5	Dyspnea	Fifth	Fifth
6	Constipation and abdominal distension	Sixth	Sixth
7	Poisoning	Seventh	Seventh
8	Amenorrhea, nausea, and vomiting	Eighth	Eighth
9	Baby diarrhea	Ninth	Ninth

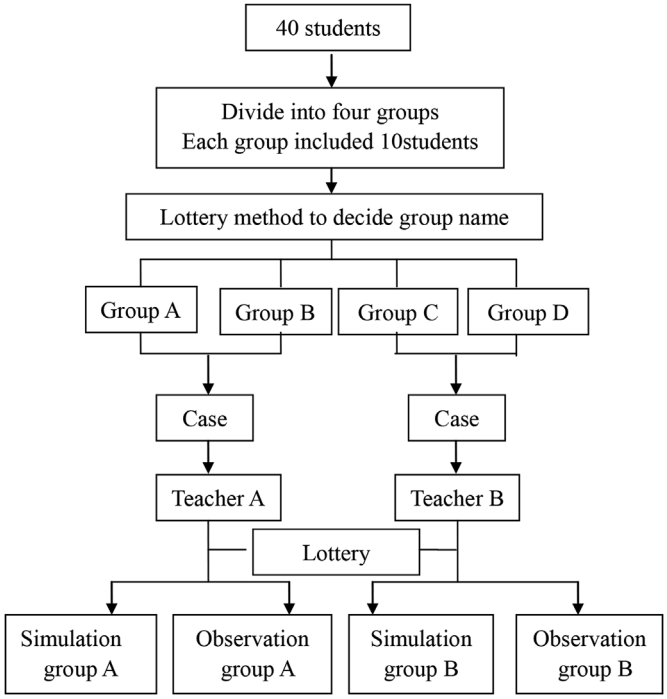

Fig. 2. Division into groups and case assignment.

teacher A and teacher B randomly selected by lottery method extracted their own group of simulation group A and observation group A, simulation group B and observation group B (Fig. 2).

(2) Teaching hours. The study was conducted during the second semester among the third grade students; Due to the limitation of credits, we set a total of 18 periods (13.5 h) as 1 credit, and a total of two periods with 1.5 h per week. The theory teaching was 2 periods (with a total of 1.5 h), the teaching of group cooperative learning cases was 16 periods (with a total of 12 h).

(3) Teaching approach. Teaching methods varied according to different time and contents of the teaching design. Discussion before class: Students conducted collaborative learning via discussions in their spare time. Each member of a group was required to participate in a specific collective group task, which was emphasized in our research. Both the chairperson and the recorder of each group were fully authorized to fulfill their tasks. The information Trace information was recorded by photograph or video. Scenario simulation and discussion method were used during class. To ensure the completion of the case content, we use the situational simulation to reflect the process of the nursing work. Partial teaching objectives were achieved in the processes of students' organization, rehearsal, simulation and discussion, which were cheerful and relaxed and were videotaped entirely. After class: collective study of both file and reflection diary. (Fig. 3).

2.6. Study tools

The California Critical Thinking Disposition Inventory (CTDI) was assessed using an “instrument to measure the critical thinking abilities of nursing students”, which has been proved to be a proper instrument for assessing the critical thinking abilities of nursing students in different cultural contexts (Lskifoglu, 2014). Considering both language and cultural differences, we adopted the Chinese version, which has been translated, modified, and validated by Chinese scholars (Peng et al., 2004). The test for the critical thinking disposition inventory (CTDI-CV) indicated a good overall CVI (0.89) and alpha (0.90), indicating satisfactory content validity and internal consistency (Peng et al., 2004).Scores of 40 or above in one dimension of the CCTDI indicate a positive critical thinking ability in this dimension; while scores of 280 or more in total suggest a positive critical thinking ability in general. The CTDI-CV retained the same seven dimensions than the original which are truth-seeking, open-mindedness, analyticity, systematicity, self-confidence, inquisitiveness, and maturity (Facione et al., 1992); the total scoring points and assessment criteria remained consistent with previously published criteria (Peng et al., 2004).

2.7. Data collection

Data were collected over three stages in one semester via self-report. The critical thinking disposition inventory (CTDI-CV) was used to evaluate the effects of the critical thinking abilities of both groups during the1st week (pre-test), the 9th week (mid-test), and the 18th week (post-test). All stages of assessment were conducted by a trained researcher, who was independent of the research team. The distributing, collecting and checking of questionnaires were completed by the same researcher, and the recovery of it was 100%.

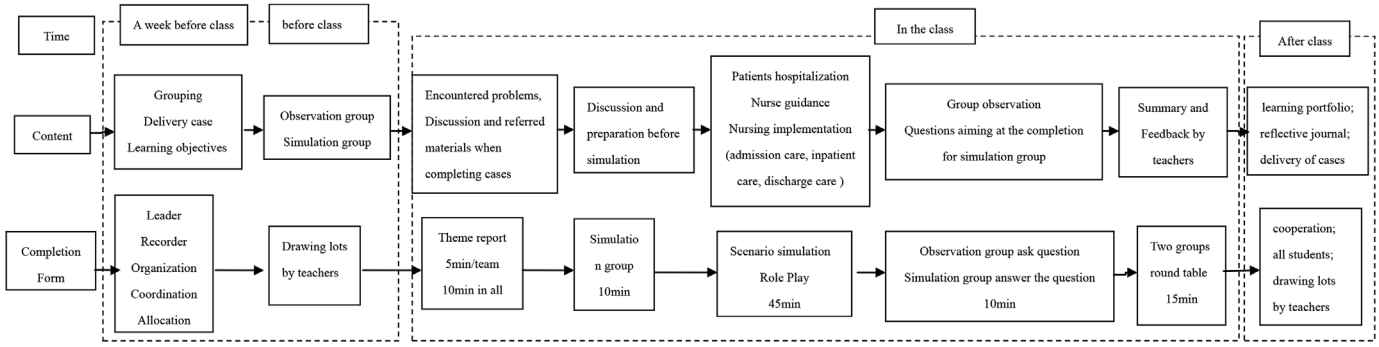

Fig. 3. Project of implementing plans of teaching design.

2.8. Statistical analyses

The statistical analysis software SPSS vison18.0 (SPSS Incorporated, Chicago, IL, USA) was used to perform data analysis. Independent sample *t*-test was applied to compare baseline levels between groups. Two factors of variance analysis were used to analyze the variability caused by both intervention factors and time factors on the intervention effect between both groups. If there was an interaction effect, simple analysis was required to clarify the factors or time factors in another factor differences between different levels. A p value of less than 0.05 was considered statistically significant.

3. Results

3.1. Pre-test mid-test and post-test score comparison between the two groups

The results showed that the scores of the two groups were lower in Pre-test, and the related indexes of the two groups were improved after the intervention. For the intervention effect, two factors (group × time) analysis of variance were used. Two factors were group factor and time factor, group factor was divided into two levels, experimental group (G1), and Control group (G2), Time factor included three levels (Pre-test, mid-test and Post-test).The results of the two-factor analysis of variance showed that the main effect of the group wise factor group on the critical thinking ability was statistically significant differences ($F = 15.668$, $P = 0.000$), and the main effect of each factor was statistically significant differences($P < 0.05$).The difference between the critical thinking ability and the factor index were statistically significant differences. However, whether there was a statistically significant differences between the groups before the intervention, or whether there was a statistically significant differences between the groups after the intervention, the conclusion was not clear. Time factor can also explain the difference of scores between the two groups at different time points ($P < 0.001$).The time factor had statistically significant differences between the two factors. At the same time, an interaction between groups wise factor and time factor in the relationship between critical thinking ability and each factor was statistically significant differences ($P < 0.05$), indicating that group factor and time factor Changed in the indicators before and after the intervention at the same time work, as shown in Table 2.

3.2. Simple effects test of critical thinking ability

In order to further explore the relationship between the factors of an interaction and critical thinking ability of two groups, this study had carried on the simple effect test to each level of group factor and time factor. The scores of critical thinking abilities in both groups were not significant at the pre-test ($F = 0.001$, $P > 0.05$). At the experimental group level, the critical thinking ability score of the simple effect test was statistically significant differences ($F = 69.363$, $P < 0.001$), it indicated that "nursing case-based learning "course had a long-term effect on critical thinking ability. The simple effect test of the total score of the critical thinking ability was statistically significant differences ($F = 4.828$, $P < 0.05$), it indicated that with the passage of time, the abilities for critical thinking ability by other factors have also received an effective upgrade. For the mid-test, statistically significant difference was found between both groups ($F = 22.297$, $P < 0.01$). For the post-test, statistically significant difference was found between both groups ($F = 61.853$, $P < 0.01$). It indicated that the short-term and long-term effect of the "nursing case-based learning" course on the critical thinking ability of the experimental group was higher than that of the control group, as shown in Table 3.

4. Discussion

4.1. "Nursing case-based learning" course improves nursing student's critical thinking ability

The results showed that the scores of critical thinking abilities had increased in the control group over the course of the three test points whole semester; however, after finishing all routine courses, the total and the three dimensions scores of critical thinking abilities did not reach a positive level. This indicated that although nursing educators paid more and more attention to the cultivation of students' critical thinking abilities, the effects still failed to meet the requirements of students. But the results of this current study revealed that "nursing case-based learning" course could improve nursing student's critical thinking ability. The reasons may be related to the following factors: Firstly, the study was based on the work process of the "nursing case-based learning" course content design, which emphasized not only the disease itself, but also the emotional experience of individual patients, thus providing realistic material for cultivar system and for the abilities and the self-confidence of nursing students. Secondly, the course was based on the nurses' work processes and provided a more practical training platform for an interaction between teachers and students, creating an open thinking training for nursing undergraduates to search for the truth (Missen et al., 2014). Thirdly, the multidimensional teaching method can induce students to develop a new perspective on the construction of novel cognitive structures and knowledge sublimation during learning, to promote the analytical abilities in nursing undergraduates as well as other aspects of training (Zhang et al., 2016). Fourthly, the course content included different cases and similar scenes, and different case scenarios were finished via repeated simulation and thinking, which promoted cognitive maturity of nursing undergraduates (Gao et al., 2016). Therefore, "nursing case-based learning" course promoted the critical thinking ability of nursing undergraduates, which was achieved via a combination of curriculum idea, teaching content, classroom teaching design, teaching organization form, and teaching methods.

Table 2
Two factors were compared as scores of pre-test, mid-test, and post-test to assess critical thinking skills.

Outcome measures	Measure Time			Group Factor		Time Factor		Interaction Effect	
	T1 (Pre-test), Mean T SD	T2 (mid-test) Mean T SD	T3 (Post-test) Mean T SD	*F*	*P -value*	*F*	*P -value*	*F*	*P -value*
Truth seeking				13.583	0.000	94.430	0.000	22.967	0.000
Experimental group (G1)	35.75 ± 6.72	42.77 ± 6.17	45.92 ± 3.92						
Control group (G2)	35.85 ± 7.33	37.87 ± 5.15	38.42 ± 4.65						
Open-mindedness				15.889	0.000	83.778	0.000	30.764	0.000
Experimental group (G1)	35.70 ± 6.47	43.52 ± 5.68	46.57 ± 4.49						
Control group (G2)	35.80 ± 7.29	37.92 ± 5.65	38.40 ± 4.90						
Analyticity				18.952	0.000	94.124	0.000	35.957	0.000
Experimental group (G1)	36.07 ± 6.33	44.35 ± 4.52	46.32 ± 4.19						
Control group (G2)	35.92 ± 7.17	37.73 ± 5.95	38.43 ± 5.00						
Systematicity				15.170	0.000	79.634	0.000	24.916	0.000
Experimental group (G1)	36.10 ± 6.23	43.32 ± 5.28	46.10 ± 4.32						
Control group (G2)	35.97 ± 7.11	38.32 ± 5.03	38.70 ± 4.54						
Self-confidence				14.888	0.000	84.307	0.000	23.901	0.000
Experimental group (G1)	36.05 ± 6.22	43.35 ± 5.21	46.10 ± 4.32						
Control group (G2)	35.85 ± 7.33	38.35 ± 5.07	38.83 ± 4.37						
Inquisitiveness				13.215	0.000	83.803	0.000	28.093	0.000
Experimental group (G1)	35.50 ± 6.74	43.32 ± 5.34	46.05 ± 4.31						
Control group (G2)	36.00 ± 7.01	38.32 ± 5.04	38.73 ± 4.46						
Maturity				16.006	0.000	61.531	0.000	22.059	0.000
Experimental group (G1)	35.62 ± 6.77	42.95 ± 5.08	45.75 ± 4.60						
Control group (G2)	35.75 ± 7.63	37.42 ± 5.0	38.07 ± 4.27						
Total score				15.668	0.000	83.035	0.000	29.516	0.000
Experimental group (G1)	250.81 ± 45.07	303.60 ± 35.22	322.82 ± 29.07						
Control group (G2)	251.15 ± 50.82	265.95 ± 36.08	269.58 ± 31.44						

4.2. Strict instructional design is the guarantee for the smooth implementation of "nursing case-based learning" course

Studies have shown the quality of internal and external group discussions to be critical to the success of nursing case studies (Cone et al., 2016). Given that and to ensure quality, this study conducted quality control from four aspects of curriculum design: First, each group chairperson and recorder were required to be replaced throughout the course, to enable continuous transformation and a sense of responsibility to improve the team's ability to cooperate. Second, it was required that every team leader completed at least three discussions after class, and each time, the recorder used video or camera to record the situation to accomplish quality supervision. Third, the curriculum design included 10 min group reports and 10 min problem asking, during the discussion process. The teacher could further determine the thinking abilities of the students of both groups in the process of solving the same problem. Fourth, teachers and students used a double-blind design during the teaching design, the matching of teachers and students via lottery decision, the case of the simulation was completed by the lottery decision. The entire process limited the autonomy of teachers and students to overcome lazy thinking in students.

4.3. Multi-episode nursing cases content is the driving force of students 'critical thinking ability

Unlike the usual CBL, the content of "nursing case-based learning" course was based on nurses' work process unfolding CBL, which was close to the "real nursing situation". The closer multi-episode nursing cases were to the nursing reality, the more effective it would be to attract and motivate students to solve problems and to encourage in self-directed learning (Yoo et al., 2010; Hong and Yu, 2016). Students can explore and develop relevant knowledge via simulated activities and acquire skills that match a real situation (Kulak and Newton, 2015). Unfolding each episode of the case story and motivating students to answer the relevant critical thinking questions guided the students through a complete nursing process in the classroom. This virtual process not only enabled them to experience a holistic nursing care process that led to specific patient care outcomes, but also predicted and assessed the immediate impact of their intervention, and validated these by comparing their predictions with the "truth" when the next episode was unfolded. By encouraging students to engage in independent learning and to critically link theory to practice, multi-episode nursing cases approach helped students to develop a mind map about a complete holistic nursing process (Brandon and All, 2010), thus making the learning process more engaging in developing their critical thinking ability.

5. Conclusion

Nursing case-based learning" course could improve the critical thinking ability of nursing student's. Strict instructional design was the guarantee for the smooth implementation of "nursing case-based

Table 3
Simple effects test of critical thinking abilities scale.

Source of Variation	Truth seeking		Open-mindedness		Analyticity		Systematicity		Self-confidence		Inquisitiveness		Maturity		Total score	
	F	*P -value*	*F*	*P-value*	*F*	*P-value*	*F*	*P-value*	*F*	*P-value*	*F*	*P-value*	*F*	*P-value*	*F*	*P-value*
G WITHIN T1	0.004	0.949	0.004	0.948	0.010	0.921	0.007	0.934	0.017	0.896	0.106	0.746	0.006	0.938	0.001	0.974
G WITHIN T2	14.844	0.000	19.516	0.000	31.421	0.000	18.772	0.000	18.949	0.000	18.522	0.000	23.838	0.000	22.297	0.000
G WITHIN T3	60.914	0.000	60.495	0.000	58.632	0.000	55.761	0.000	55.961	0.000	55.732	0.000	59.815	0.000	61.853	0.000
T WITHIN G1	60.378	0.000	76.722	0.000	76.473	0.000	64.517	0.000	67.090	0.000	69.704	0.000	51.382	0.000	69.363	0.000
T WITHIN G2	4.118	0.020	4.728	0.012	4.364	0.016	5.170	0.008	6.164	0.003	4.885	0.010	3.446	0.037	4.828	0.011

Abbreviations: G, group; G1, Experimental group; G2, Control group; T, time point; T1, pre-test; T2, mid-test; T3, post-test.

learning" course. This approach has no time or space restrictions and fosters greater participation and communication between students and teachers resulting in a small class size learning environment with considerable advantages. While based on real multi-episode nursing situation of "nursing case-based learning" course implement an appropriate virtual learning content, thus making the learning process more engaging in developing their critical thinking ability.

However, the limit of our study was that, at the end of the second semester, nursing students were assigned to different hospitals to participate in clinical. Consequently, there were too many external factors, impeding an exploration of the long-term effects of intervention on the critical thinking abilities of students. In future study, we can assigned the student in the same hospital to ensure the researcher could explore the long effect of "nursing case-based learning" course on the critical thinking abilities of nursing undergraduates.

Declarations of interest

The authors declare that they have no conflict of interest.

Conflicts of interest

The authors declare that they have no conflict of interest.

Ethical approval

All participants gave informed consent and this study was reviewed and approved by the Huzhou University Medical Ethics Committee. All authors contributed to the paper in accordance to guidelines.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.nepr.2019.03.007.

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