Effect of Case Studies Combined with Concept Mapping Technique on Critical Thinking of Nursing Students*

Krittaporn Sirisom, RN, PhD candidate[1], Panatsaya Wunnawilai, RN, MSN[1],

Amavasee Ampansirirat, RN, DrPH[1], Soawaprek Chuencharoen, RN, MSN[1],

Arisa Chitviboon, RN, MNS[1]

Abstract

Purpose: This study aimed to examine the effect of utilizing techniques of case studies combined with concept mapping on the critical thinking ability of nursing students.

Design: A quasi-experimental research.

Methods: The study sample consisted of 91 second-year nursing students who participated in teaching/learning program, using case studies combined with concept mapping (CSCM program), in pathophysiology course. Data were collected using the Praboromarajchanok Institute's Critical Thinking Appraisal, and open-ended questions were used to assess students' perception of the CSCM program. Quantitative data were analyzed using descriptive statistics and the hypothesis was tested using the paired t-test. The reflective data were analyzed through content analysis.

Main findings: There was no statistical difference between the mean scores of critical thinking ability before and after implementing the CSCM program. However, content analysis based on students' perception of the program revealed that these teaching techniques helped enhance the students' competency in developing thinking and being an active learner.

Conclusion and recommendations: Although the 4-week CSCM program was shown no effect to enhance nursing critical thinking of nursing students, it is useful to promote students in developing their thinking process and in becoming active learners. Findings of this study indicate that the research on the CSCM program's effect on critical thinking should be conducted with a control group experimental and randomization in longer period or longitudinal study design.

Keywords: concept mapping, case studies, critical thinking, nursing students

ผลของการจัดการเรียนรู้โดยใช้กรณีศึกษาร่วมกับแผนผังแนวคิดต่อการคิดอย่างมีวิจารณญาณของนักศึกษาพยาบาล

กฤตพร สิริสม, พย.ม.[1] พนัสยา วรรณวิไล, พย.ม.[1] อมาวสี อัมพันศิริรัตน์, ส.ถ.[1]
เสาวพฤกษ์ ชื่นเจริญ, พย.ม.[1] อริสา จิตต์วิบูลย์, พย.ม.[1]

บทคัดย่อ

วัตถุประสงค์: เพื่อศึกษาผลของการจัดการเรียนรู้โดยใช้กรณีศึกษาร่วมกับแผนผังแนวคิดต่อการคิดอย่างมีวิจารณญาณของนักศึกษาพยาบาล

รูปแบบการวิจัย: การวิจัยกึ่งทดลอง

วิธีดำเนินการวิจัย: กลุ่มตัวอย่างเป็นนักศึกษาพยาบาล ชั้นปีที่ 2 จำนวน 91 คน ซึ่งเข้าร่วมกิจกรรมการเรียนการสอนโดยใช้กรณีศึกษาร่วมกับแผนผังแนวคิด ในรายวิชาพยาธิสรีรวิทยา เก็บรวบรวมข้อมูลโดยใช้แบบประเมินความสามารถในการคิดอย่างมีวิจารณญาณของสถาบันพระบรมราชชนก และใช้คำถามสะท้อนคิดชนิดปลายเปิดประเมินการรับรู้ของนักศึกษาต่อรูปแบบการจัดการเรียนรู้โดยใช้กรณีศึกษาร่วมกับแผนผังแนวคิด วิเคราะห์ข้อมูลเชิงปริมาณโดยใช้สถิติเชิงพรรณนา และทดสอบสมมติฐานโดยใช้สถิติ Paired t-test ข้อมูลจากการสะท้อนของนักศึกษาใช้การวิเคราะห์ข้อมูลเชิงเนื้อหา

ผลการวิจัย: ความสามารถในการคิดอย่างมีวิจารณญาณของนักศึกษาพยาบาลก่อนและหลังการจัดการเรียนรู้แบบกรณีศึกษาร่วมกับแผนผังแนวคิดไม่แตกต่างกัน อย่างไรก็ตาม การวิเคราะห์ข้อมูลเชิงเนื้อหาเกี่ยวกับการรับรู้ของนักศึกษาต่อรูปแบบการจัดการเรียนรู้โดยใช้กรณีศึกษาร่วมกับแผนผังแนวคิด พบว่าเทคนิคการสอนดังกล่าวช่วยพัฒนาศักยภาพของนักศึกษา ในประเด็นของการพัฒนากระบวนการคิด และการเป็นผู้เรียนแบบเชิงรุก

สรุปและข้อเสนอแนะ: แม้ว่าการจัดรูปแบบการเรียนรู้โดยใช้กรณีศึกษาร่วมกับแผนผังแนวคิด ในระยะเวลา 4 สัปดาห์ ไม่มีผลต่อการพัฒนาความสามารถในการคิดอย่างมีวิจารณญาณของนักศึกษาพยาบาล การเรียนรู้ในรูปแบบดังกล่าว มีประโยชน์ในการส่งเสริมการพัฒนากระบวนการคิด และการพัฒนาศักยภาพผู้เรียนแบบเชิงรุกของนักศึกษา จึงควรมีการทำวิจัยแบบทดลอง หรือกึ่งทดลองที่มีกลุ่มเปรียบเทียบ เพื่อศึกษาประสิทธิผลของโปรแกรมในระยะยาวต่อไป

คำสำคัญ: แผนผังแนวคิด กรณีศึกษา การคิดอย่างมีวิจารณญาณ นักศึกษาพยาบาล

Background and Significance

Critical thinking (CT) is a process of rational and systematic thinking, of considering facts and problems or issues prior to making decisions. In the nursing arena, CT has been described as the ability in clinical reasoning, in exercising clinical judgment and in problem- solving.[1-2] It can be characterized as having an attitude of inquiry, skill in data classification, and deducing accurate knowledge. Previous studies have shown that critical thinking skills help to develop competency in nursing process[3] and clinical decision-making.[4] Therefore, critical thinking is both the desired outcome and the main goal of nursing education.

A school of nursing is required to produce high quality nursing graduates who are well equipped for analytical thinking, decision-making, and appropriate problem-solving. However, a study of critical thinking in nursing students who have graduated from one nursing college showed that the majority of the graduates had a low level of critical thinking abilities.[5] An analysis of the curriculum of the Nursing Science Program (revised program B.E. 2552) found that the objective of a course specifying developing thinking skills was not clear and the instructors taught nursing students according to their own understanding. Thus, teaching and learning to promote critical thinking in the past has lacked systematic and continuous development. Lecture was used as the main teaching approach which focused mostly on the subject content. The primary role of the students was to absorb content which was neglected to develop their own potential and critical thinking. Teaching nursing students how to solve problems and think critically usually began only when they started to have a clinical practice, resulting in a low level of critical thinking in nursing students. Consequently, critical thinking must be taught as soon as possible. Castledine[6] has suggested that the practice of critical thinking should start early because it is a skill that is developed through continual experience and practices. It should be, therefore, assumed that the teaching and cultivating critical thinking has to start when a theory is taught in the courses.

Case studies and concept mapping have been recognized as useful educational strategies to promote critical thinking.[7-10] Case studies allow students to experience real client situations to which they may not have access to clinical settings. Case studies promote the development of critical thinking skills by providing the opportunity for problem identification, seeking information, direct data analysis, discussion, decision-making, and learning how to solve problems.[10] In the same way, concept mapping is a tool for organizing ideas and concepts and representing relationships among concepts[11] which reflect thinking processes. Through the mapping process, learners may examine their own existing knowledge and learn how to think in more critical and complex ways rather than only in a linear manner.[12] Concept mapping, therefore, can be used as an educational strategy to help synthesize, organize, and prioritize data in a logical sequence that facilitates CT.[13] Wheeler and Collins[14] found that the CT skills of sophomore baccalaureate nursing students improved after conducting concept mapping in a clinical setting for one semester. Using case studies combined with concept mapping (CSCM) in a hospital-based teaching program showed that CSCM was more effective in promoting CT skills than just by using case studies alone.[15] However, at present, there is a lack of evidence for applying and testing CSCM in promoting CT skills in classroom teaching in a pathophysiology course of a 4-year nursing science program. Therefore, this study was conducted to examine the effect of a CSCM program in cultivating CT ability of nursing students in such a course.

Objectives

1. To compare the critical thinking ability of second-year nursing students before and after implementing the CSCM program in a pathophysiology course.

2. To assess student's perception of the CSCM program.

Research Question/Hypothesis

This study was conducted based on two research questions: 1) What is the effect of the CSCM program on the critical thinking ability of second-year nursing students, and 2) what are the perceptions of nursing students about learning through case studies combined with concept mapping teaching strategies? The hypothesis was that a significant difference in CT abilities would be noticeable before and after implementation of the CSCM program.

Methodology

This study used a quasi-experimental design with one group pre-test and post-test to determine whether nursing students showed an improvement in critical thinking ability after implementing CSCM program.

Population and Sample

The target population was second-year nursing students in baccalaureate nursing program at the Boromarajonani College of Nursing Songkhla. A study sample was purposively selected. It consisted of 91 nursing students who enrolled in a pathophysiology course in the 1st semester, academic year 2013 and willing to participate in teaching/learning activities during 7-28 September 2013.

Research Instruments

The research instruments in this study were composed of two parts.

Part I: For quantitative data collection, the Praboromarajchanok Institute's Critical Thinking Appraisal (PlCTA) was used with seven subscales: 1) identifying problem, 2) collecting information, 3) credibility of source of information, 4) identifying information, 5) hypothesis, 6) conclusion, and 7) evaluation. The instrument consisted of 42 items in a multiple choice format. The range of possible score was 0-42, with each subscale having a possible score range of 0-6. An overall score of 0-24 indicated a low level of CT ability, a score of 25-33 reflected an average level of CT ability, and a score above 33 was indicative of a high level of CT ability. The reliability, as determined by Kuder-Richardson-20 test, was 0.705 and 0.33 was achieved in this study.

Part II: For qualitative data collection, two open-ended questions were employed to assess the students' perception of the CSCM program as follows:

1. What did you think or feel about the learning activities using case studies and concept mapping?

2. What did you learn from the new learning activity?

The questions were posted in the pathophysiology's group facebook page that encouraged the students to express and send their opinions to the researcher by e-mail after finishing the program.

Data Collection and Procedure

This study was approved by the Institutional Review Board and Ethics Committee of the research setting (BCNSK7/2556) with written and verbal consent obtained from all participating students. The participants were informed that data collected by the researchers in this study would remain confidential and that they would be free to withdraw from the study without affecting their grades. The participants completed the demographic form and PICTA prior to receiving CSCM instruction. The learning and teaching manual including research procedures and case studies were also provided to the students at the same time. The participants were divided into 10 groups with 10-11 nursing students in each group and facilitated by 4 faculty members. The CSCM program consisted of 4 sessions, namely, the pathophysiology of the respiratory, cardiovascular, gastrointestinal, and urinary systems with sixteen case studies (see Table 1). The contents of all case studies were verified by five experts: three experts on pathophysiology, one linguistic expert, and one expert on curriculum development and learning-teaching.

Table 1: List of topics and case scenarios for group sessions

Week	Topics	Case scenarios
1	Respiratory system and its related issues	1. Hemopnuemothorax
		2. Chronic obstructive pulmonary disease (COPD)
		3. Asthma
		4. Severe emphysema with pnuemothorax
2	Cardiovascular system and its related issues	1. Hypovolemic shock
		2. Septic shock with DIC
		3. Anaphylactic shock
		4. Acute myocardial infarction (AMI)
		5. Congestive heart failure (CHF)
3	Gastrointestinal system and its related issues	1. Cholelithiasis with jaundice
		2. Neonatal jaundice
		3. Chirrhosis
		4. Upper GI bleeding
		5. Intestinal obstruction
4	Urinary system and its related issues	1. Nephrotic syndrome
		2. Acute glumerulonephritis
		3. Hemopnuemothorax progress to acute renal failure* (Using the same case in session 1)
		4. CHF progress to chronic renal failure* (Using the same case in session 2)
		5. Septic shock with DIC progress to metabolic acidosis* (Using the same case in session 2)
		* Providing additional information

The program was conducted as group learning for 4 weeks, of 3-4 hours weekly. Two to three groups of students would receive the same case studies in each session. The basic knowledge of pathophysiology and its related concepts were delivered in lectures to the students prior to carrying out case analysis of each system. Based on the information and questions to foster analytical thinking provided in the case scenario, group discussion was encouraged to discover the factors and concepts/problems within the case under study. The students searched for related information using textbooks and the internet to gather more information to support their ideas. In addition, the concepts and related ideas, resulting from group discussion and analysis, were constructed and demonstrated as concept maps, which were presented to the class at the end of each session. One week after finishing the program, PICTA was administered again to re-assess the CT abilities of students. Qualitative data was obtained through electronic mail. Also, student behavior and participation were observed and recorded during learning periods to gain rich information and to carry out triangulation confirmation.

Data Analysis

The quantitative data was analyzed by using frequency, percentage, mean, and standard deviation. Paired t-test was used to compare the mean difference of critical thinking ability before and after implementing case studies and concept mapping teaching techniques. Content analysis was conducted on reflective data by the first and the second authors. Each author separately identified words, phrases, or sentences with similar content and assigned a theme/concept name. Then, emerging themes resulting from these separate analyses were compared and discussed with other members of the team prior to summarizing the final results.

Findings

Ninety-one students completed both pre-test and post-test measured by PICTA. Most participants were

female and 76.9% were ≤ 20 years old. The mean scores of overall critical thinking ability both before and after the program were found at low levels of 24.49 (SD = 3.46) and 24.08 (SD = 3.36) respectively. Thus, there was no statistical difference between mean scores of critical thinking ability before and after the program (t = .88, p = .38) (See table 2).

Table 2: Comparison of the overall mean scores of critical thinking ability before and after the CSCM program (n = 91)

CT scores	Mean	SD	t	df	p-value
Pre-test	24.49	3.49	.88	90	.38
Post-test	24.08	3.36			

The content analysis based on students' perception of CSCM program (n = 84) revealed two main themes emerged; development of thinking process and development of being an active learner.

1. Development of thinking process

The CSCM program helps students to develop their thinking process through data collection, analysis, and summary. It enhanced their process of acquiring knowledge and information strengthening their analytical and critical thinking. Students reflected how they learned to solve problems through a thinking process. One participant reported:

"This new teaching technique focused on encouraging students to analyze situations before actually studying them in the classroom, and then identifying the main issues of that situation. I practiced linking my prior knowledge to the present situation and searching for additional knowledge to describe the details of the situation. It made me learns to identify and thinks critically in analyzing situations."

As another participant said:

"I have learned how to summarize the important information of each case, and I have practiced how to link information effectively. I was able to think comprehensively basing on the scientific approach."

The students also reflected that they could analyze data systematically in terms of cause and effect. One participant reported:

"This is a good strategy for helping students in developing their thinking process to solve problems and developing critical thinking. They are able to link cause and effect to understand case studies problems."

2. Development of being an active learner

2.1 Self-development

Most participants reported that the CSCM program encouraged them to learn actively. They had to adjust themselves to be alert and take more responsibility for acquiring new knowledge. They were eager to learn from sources other than textbooks and teachers. The program also stimulated the participants to engage more in learning and direct learning activities by themselves. The teachers play a role more as a facilitator and mentor.

The CSCM program motivated students to learn and develop themselves in many ways as follows:

2.2.1 Alertness and enthusiasm in learning

Students identified that they were more enthusiastic in learning. They were needed to engage in self-study on assigned case studies before participation in the classroom and to prepare information to exchange with their peers and teachers. One participant reported:

"This teaching technique made students enthusiastic. I searched for knowledge from various sources reading more books and accessing online data. I was eager to pursue knowledge."

2.1.2 Increasing responsibility

The students felt that they had to be more diligent to obtain more information in order to improve information exchange with their peers and teachers. They became more responsibility. One participant reflected:

"It is a form of learning that encourages students to prepare themselves by finding information about the case before the class. Students must study the material before attending class every time. It stimulates the students to have more responsibility."

2.1.3 Learning to work as a team/group

The students reflected that they learned to work as a team. They could exchange different ideas and information. They learned how to plan and share responsibility to accomplish assignments. One participant said:

"This made the learning process, data searching skills, and teamwork more successful. Students could exchange ideas and information."

As another participant stated:

"It allowed students to work in groups, help each other, and build rapport with other students. Working with a group made students think more rationally."

2.2 Encouraging self-directed learning

The CSCM program encouraged students to plan and discover answers by themselves. Many students said that they had greater opportunity for self-study. They learned from various sources other than textbooks and teachers and could better understand subject content. They could improve their thinking process and problem-solving skills. One participant said:

"In order to analyze case studies, I had to read many books and study about the causes, mechanisms of disease, and nursing care of the case in advance. Students needed to study by themselves demonstrating individual initiative with the support of the group members. Students could analyze and direct their learning by themselves."

Another participant noted:

"This teaching technique made students to inquire what they did not know. Teachers were facilitators of learning. The students initiated learning by themselves. They pushed their own efforts. They could link and review what they learned in the present with their prior knowledge."

Discussion

The results showed that there was no statistical difference between the mean scores of critical thinking ability before and after implementing the CSCM program. This finding contrasts with another previous study which demonstrated improvement of nurses' CT skills following a hospital-based CSCM educational program.[15] This may be due to three factors; the limitation in study design, duration of the program implementation, and sample's age and experience. Lacking of a control group and non-randomized sampling method of this study may limit to sufficiently control for important confounding factors that may influence the measured outcome. Thus, it may not indicate that the outcomes are resulted by the program.[16] To increase the validity of these results, the study should be replicated with a comparative group or with a more random sampling method. Secondly, regarding duration of the program implementation, it is likely that a 4-week program of the current study is too short when compared to a 16-week program of the previous study. Critical thinking ability may be difficult to develop,[17] and may take more time to enhance critical thinking through the CSCM program carried out in this study. Lastly, for the difference of sample's age and experience, Alfaro-Lefevre[18] identified that age was one personal factor that influence CT, with increased age associated with a higher level of CT. As individuals age, they have more experience to practice reasoning in different situations. The sample's age in the current study was younger (≤ 20 years) than those nurse participants (average age = 27 years) in a hospital-based CSCM program. In addition, nurse participants in that study also had average working experience of 5 years in clinical practice, while the second-year nursing students did not. It may be one cause of difference in study's results. This argument was supported by Jone[17] who proposed that CT was an ingrained trait that took time and needed experience to cultivate. To address this, we suggest that a longer period of at least 16 weeks should be designated. Further, the CSCM program should be continuously tried in all nursing classes in a curriculum in a coordinated style instead of in individual classes.

However, the assessment of students' perception of the CSCM program found that there were two key themes emerged from reflected data; development of thinking processes and development of being an active learner. The later theme included; self-development consisted of alertness and enthusiasm in learning, increasing responsibility, learning to work as team; and encouraging self-directed learning. This finding is similar to other studies using problem-based learning (PBL) as a teaching/learning strategy.[19-21] For example, the Jordan nursing students expressed that they gain valuable experience in developing cognitive abilities, independent learning, motivation to learn, and group learning.[19] Likewise, Thai nursing students were experienced of being an active learner; being a systematic learner; developing friendly relationships; adjusting personal characteristics when learning; and, having freedom while learning.[20] This may be because the CSCM program and PBL shared some common characteristics that included student-centered learning, using problems scenarios as the stimulus for learning, learning in small groups, teachers as facilitators, acquiring new information through self-directed learning.[22-23] Student-centered method of learning

challenges students to actively participate in learning activities and take responsibility in their own learning.[23] In addition, the scenarios permit students to become independent inquiries in acquiring new knowledge through identifying and investigating the concepts and principles they need to know.[24] Working in small groups provides students opportunities to interact with other group members and facilitator, enhancing their communicating skill and sharing information. It helps students to have a broader view and to consider the situation from a multi-dimensional perspective and have better understanding of the problem.[19,21]

Themes finding in this study indicated that the CSCM program was helpful in enhancing the students' competency in developing thinking process and being an active learner. Encouraging self-directed learning seems to be prominent component of student's development of being active learner, as mention above. The CSCM program may be beneficial to foster the students' ability in active and self-directed learning. However, the effect of the CSCM program on students' self-directed learning ability was still unknown and needed research to support in the future. Since self-directed learning is thought to be associated with lifelong learning and has been considered as one of the important educational objectives by nursing schools,[23] assessment of nursing students' attitude on self-directed learning may be needed in preparing them to be an active learner.

Conclusion

There was no significant difference in the CT ability of second-year nursing students before and after implementing the 4-week CSCM program. However, the study findings indicated that these teaching strategies could enable the students' competency in developing their thinking process and in becoming active learners. It is likely that the study had insufficient strength, or insufficient times of instruction using CSCM program were provided. Findings of this study indicate that the effects of CSCM program on critical thinking need to be replicated. Further research should employ study design with control group and randomization to ensure better baseline comparability between groups, or use other strategies to increase internal validity such as repeated time series measurement. Additionally, it should be expanded duration of program implementation, and longitudinal study design is required.

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