

Conference Paper

Effectiveness of Combined Problem-Based Learning and Flipped Classroom Strategies in Teaching a Medical-Surgical Nursing Course: A Randomized Controlled Trial Study

Maria Silvana Dhawo

Stikes Suaka Insan Banjarmasin

Abstract

Institute of Health Science Suaka Insan Banjarmasin has been using Problem Based Learning (PBL) as an innovative teaching strategy since 2012. Students reported that they were not always enthusiastic with the processes and the tutors could not prevent the boredom during PBL implementation. The new teaching strategy is assumed to create new learning atmosphere, stimulate the students's motivation, and gain the attention to learn. These benefits would have a great impact in improving higher order thinking, problem solving, critical thinking, and independent learning. The aim of this study was to compare the effectiveness of PBL and the flipped PBL (FPBL). A randomized control trial was conducted, 84 students were recruited and divided into non-experimental group (PBL) and experimental group (FPBL). Both groups were post-tested on their academic achievement, independent learning, and critical thinking skill after the learning process specifically, medical surgical nursing course: renal system. The comparison of students academic achievement was analyzed by using t-test and Mann-Whitney test was administered to analyze independent learning and critical thinking skill. Finding showed that the students in the experimental group gained higher score in all aspects than the control group and p value in three areas are < than 0,05. Therefore, the result revealed the new teaching method was effective in improving higher order thinking skill, critical thinking skill, and independent learning. The findings provided the option for the nurse educators in Institute of Health Science Suaka Insan to develop the transformative learning strategy by implementing the new teaching method.

Keywords: Problem-Based Learning, Flipped Classroom, Flipped Problem-Based Learning, Students' academic Performance, Independent Learning, Critical Thinking Skill

Corresponding Author:
Maria Silvana Dhawo
mariadhawo@gmail.com

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1. Introduction

Institute of Health Science Suaka Insan Banjarmasin has applied Problem Based Learning (PBL) as an innovative approach in teaching and learning since 2012. Nursery [1]) revealed that the implementation of the PBL process in Institute of Health Science Suaka

Insan Banjarmasin for BS Nursing students level III was identified as a good strategy. The study found positive results regarding the PBL implementation as well as disadvantages. Many students reported that they were not always enthusiastic with the processes in PBL. Even though the PBL process could create a new environment for teaching and learning, the tutors could not prevent boredom during the implementation of the said approach. The students expressed the routine of the PBL pattern and little contact during the teaching and learning process make them feel bored. These problems were considered as factors causing uncertainty in PBL. The students need much control with their learning activity to stimulate them to be disciplined in self-directed learning. This phenomenon triggers some effects in achieving the objectives of the particular subject which described by students' academic performance [1].

According to Gagne in Sana (2010) the learning process starts with expectancy. If the learners are motivated and interested in the subject matter or what they want to learn, they will be able to receive the lesson and they will put their effort to achieve the objectives of the specific lesson. This effect will become a barrier to stimulate the students to become the independent learner, decrease their attention to learn, engage in teaching and learning activity and finally they will not be able to achieve the objectives in Nursing Education. To engage the students in the tried and tested PBL approach, the teachers in STIKES Suaka Insan decided to adopt the flipped classroom, a new innovative approach and blend it with the PBL process. A flipped classroom or inverted classroom is a class where the lecture and homework have been reversed [2]. This means that teacher assigns the class to read their assignments ahead of time, watch a video, or work on a case prior to the actual face-to-face meeting. Then during the actual meeting, the class can be instructed to take a test on the assignments, or engage the class in small group work about the assignments. A Flipped classroom will create a new atmosphere for the millennial students. It allows the utilization of technology to lead the educational process. With the delivery of course content saved through technology, educators feel free to introduce activities outside the classroom that would give students the opportunity to engage with the learning material. With these benefits would have a great impact in improving higher order thinking, problem solving, critical thinking, and independent learning [3].

Tawfik in 2015 [4] conducted a study about "Using a flipped classroom approach to support problem based learning". The study revealed students have positive perceptions regarding the implementation of problem based learning. The teaching approach increased the students' motivation to solve the problem in the ill structured form. The utilization of the video lecture could improve students' self-efficacy. The students noted

that the environment in a flipped classroom helps them to encourage themselves internally. Lecture video allowed the students to learn in their own way. It provided the explanation about the subject matter, when the teacher was not present. That becomes the reason why a flipped classroom influences their willingness to have a self-directed learning session before they encounter the class. Therefore, they are ready to participate in the class activity and share what they have learned with the fellow learners. This study provided the information to help the nurse educators in Institute of Health Science Suaka Insan to prevent the boredom in the PBL process. However, the efficacy of these combined teaching-learning strategies need to still be established specifically in terms of critical thinking skill, independent learning, and academic achievement as the outcome of the 21st century health professional education [5]. This study will become a benchmark to practice the FPBL in Institute of Health Science Suaka Insan Banjarmasin.

2. Methods

2.1. Design and sample

A true experimental design (randomized posttest only control group design), concept map presentation, and written examination were utilized to compare the effectiveness of PBL and FPBL on students' academic achievement, independent learning, and critical thinking skill [6]. Eighty four (84) students participated in this study. These students were randomized into two groups: The group of PBL as non-intervention group and the group of FPBL as intervention group. Randomization followed the fishbowl method. Eighty four (84) rolled small papers were placed in a bowl. There were 42 rolled papers marked as number 1 and another 42 papers marked as number 2. Number 1 stands for non-intervention group and number 2 stands for the intervention group.

The informed consent form was secured. In terms of possible risk and discomforts, the respondents were assured that their participation in the study will not influence the grading system in the renal course. The researcher also assured the participants of the confidentiality of their names and identities, as well as the data they would provide. The data will not be used for any other purposes outside this research.

2.2. Procedure

The subject of this study came from BS Nursing Student level III, who took renal system course. Renal system is a crucial subject for BS Nursing students as a part of Medical

Surgical Nursing course. The load of this course is 2 units, and taught in a block schedule for 5 weeks. During the last week, the course coordinator arranged it as a schedule for make up class. The researcher utilized the make up class to conduct this study.

84 students were selected randomly into two groups would be having a post-tested on their academic achievement after following the teaching and learning process in renal system with two different teaching strategy. In case of independent learning and critical thinking skill, both groups were given the quantitative survey after the post-test to determine their ability on both areas. PBL and a Flipped Classroom gave a premium to progressive disclosure of the case or problem therefore, this study will not be using pre-test. This design is recognized as the strongest of all designs in an experimental study, and ideal with at least forty subjects in each group [6]

The data collection commenced after securing approval of the Universitas Lambung Mangkurat Banjarmasin as a local ethic board in Indonesia and University of The Philippines Manila Research Ethics Board, a letter of explanation, and the administration clearance from the Institute of Health Science Suaka Insan Banjarmasin.

2.3. Intervention program

This study was divided into three phases. The first phase refers to the preparation stage where the researcher completed the instructional module for the lesson, video, and the test that were used for the study. The implementation consisted of 5 sessions; 4 sessions will be employed for teaching and learning process and the last session for students' evaluation (6 hours for teaching and learning process and 3 hours for evaluation process).

The second phase referred to the actual experiment. Each group had a faculty facilitator. They were taught using two different teaching approaches in the same module. There were 8 tutors assigned to facilitate the groups of students (4 groups for non-intervention; 4 groups for intervention). In non-intervention group or control group, the teaching and learning process followed the regular PBL process. It was divided into 2 sessions for 1 topic/module. The first session dealt with the problem introduction and task distribution (from jumps 1 to 5) and the second session referred to solving the problem based on the findings during self-directed learning jumps 6 to 7 [3]. The interval between first session and the second session was 6 hours hence the students had enough time to do self-directed learning, obtain the information that would answer their learning goals and the information contamination between the two groups would be minimized. Each group was given a day to arrange their concept

map before grand presentation. During the grand presentation, the tutors were able to measure the end product of the problem solving process and establish the effect of the experiment to academic achievement as experienced by students using the two teaching approaches. Time allocation for grand presentation was an hour. The first module was nursing management of the client with chronic renal failure and the second module was nursing management of the client with dialysis.

The arrangement of intervention group or experimental group followed the non-intervention group. However, the step on self-directed learning (SDL) was changed a bit. In intervention group the SDL process involved watching a video lecture of the related topic. The students were instructed to watch the lecture video at their convenient time and find other resources to solve the problem integrated in the lesson. On the second session, the group went through class activity which was the same as the first group. The experimenting process also took 6 hours.

The last phase referred to the posttest which took 2 hours. After the post-test, the groups of students in FPBL were required to fill up the survey questionnaire about independent learning and critical thinking skills.

2.4. Instrument measure

A test blueprint was prepared for the post-test of the two teaching-learning strategies. The test measured accurately and adequately the specified objectives of the content areas. It consisted of 25 multiple choice questions and 2 extended essay questions for both topics. The 25 multiple choice questions followed the Bloom's taxonomy domain from understanding to evaluating levels. They were rated by the researcher with total score of 50 points. The 2 extended essay questions were on creating level; it was rated by the course coordinator (single rater). In case of independent learning and critical thinking skill, both groups were given the quantitative survey after the post-test to determine their ability on both areas. The survey questionnaire for independent learning and critical thinking skill were adopted from Sumartiningsih [7]. The Likert scale questionnaire consists of 21 statements for independent learning and 21 statements for critical thinking skills. The survey questionnaire emphasized the development of a flipped learning for BS Nursing Students in University of Pelita Harapan, Indonesia. The tool has been confirmed as reliable with the value of Chronbach's alpha was 0.78 for Independent learning and 0.87 for Critical Thinking Skill.

2.5. Data analysis

Evaluation of the effectiveness of the two teaching approaches was determined by comparing the examination results of students. Since post-test score were the real test scores within two different subjects, they were compared using unpaired t-test with a p value less than 0.05 considered significant. The independent learning and critical thinking skill on the PBL group and FPBL group were analyzed using Mann-Whitney Test. Test (intergroup comparison) and % gain scores were compared using a p value less than 0.05 to be considered significant.

3. Results

Students' demographics are summarized in table 1. Of the 84 students in 2 groups; 10 (23,81%) were male and 32 (76,19%) female in non-experimental group, 8 (19,04%) were male and 34 (80,96%) female in experimental group.

TABLE 1: Students' Demographics.

| Gender | Problem Based Learning | Combination of Problem Based Learning and Flipped Classroom |
|----------|------------------------|---|
| Male % | 23,81 | 19,04 |
| Female % | 76,19 | 80,96 |

The table below presents the summary statistics of students' performance in MCQ, and essay tests. The mean score for PBL group was at 34.17 for MCQ and for extended essay questions was at 37.71. The mean score for the FPBL in the MCQs was 36.67 and for extended essay questions was 40.38. Test analysis showed that the mean of FPBL was significantly higher than PBL and p-value in two different test was less than 0,005. It indicated there was a significant difference between post-test score in both groups.

TABLE 2: Students' performance in post test.

| Catagory | Mean Problem Based Learning | Mean Combination of Problem Based Learning and Flipped Classroom | P-Value |
|---|-----------------------------|--|---------|
| Student's academic achievement: MCQ (Post test) | 34,14 | 36,67 | 0,022 |
| Student's academic achievement: Essay (Post test) | 37,71 | 40,38 | 0,034 |

Table 3 shows that there was a slight difference in the mean scores between the group in PBL and that of the FPBL. The mean score for PBL was 60.19 and that of the FPBL was 73.60 in independent learning and the mean score for critical thinking

skill in PBL was 59.19 and mean score for the FPBL was 71.10. Their difference has been tested using Mann Whitney test. Obtained values showed a significant difference between students' independent learning and critical thinking skill in PBL and in FPBL with p-value $0,000 < 0,05$.

TABLE 3: Students' performance in independent learning, and critical thinking skill.

| Catagory | Mean Problem Based Learning | Mean Combination of Problem Based Learning and Flipped Classroom | P-Value |
|-------------------------|-----------------------------|--|---------|
| Independent Learning | 60,91 | 73,60 | 0,000 |
| Critical Thinking Skill | 59,19 | 71,10 | 0,000 |

4. Discussion

The mean score in post-test revealed that the new teaching method provided mastery learning outcome and higher order thinking skill better than the previous conventional PBL both in multiple choice questions and extended essay questions. The result of the students' academic performance in written test stressed the direct role of the flipped classroom in supporting the implementation of the PBL process. It pointed out the behaviorism theory in flipped classroom complemented the constructivism theory in PBL. Specifically, the role of tutor as a facilitator to provide further guidance in problem solving process [8]. teacher had a main role to guide the students in PBL session, the combination method was not putting the teacher at the center of the teaching process. The teacher engaged the students in meaningful activities and organized relevant learning content for the flipped purpose, it might be the reason why the students in the combination method showed a better objective evaluation in post-test [9].

In terms of independent learning, the result proved that responses students were statistically different from each other. Students appreciated the opportunities given to them to engage in practicing their autonomy and this is consistent with the competence required of professionals in the 21st century transformative learning. By becoming the independent learner, the students are expected in promoting a meaningful change for future nursing profession in Indonesia [10]. Mean score for students' critical thinking skills shows that, the students in the experimental group gained higher score than in non experimental group. The group of students in the combination method were more ready to convey their judgement towards the issue during problem solving process. They were able to connect the information and built new comprehensions by constructing each idea and opinion.

Mean Scores showed the intervention group had higher independent learning and critical thinking skill than non-intervention group. The result indicated that teachers' adoption of problem-based learning and teaching design (a flipped classroom) for students' learning activities is helpful for students to solve the problem, improve their critical thinking skills and independent learning.

This study supported the four pillars of a flipped classroom, namely flexible environment, learning culture, intentional content, and professional educator to engage the students in flipped learning [4]. Flexible environment refers to providing a new approach for the students to learning the specific material and achieve mastery learning by using technology. Promoting learning culture means a providing an opportunity where the teachers are not the center of the teaching process by engaging the students in meaningful activities. The teacher as a tutor in the combination method could organize the relevant learning content and consider the accessibility to all the students in realizing the intentional content. As a professional educator, teacher should maximize students' evaluation by observing them during the classroom schedule or PBL process and recording data for a future flipped class improvement. Another concern presented from the observation of the researcher was that the group of students in the FPBL showed their readiness for class activity (tutorial II). They were more knowledgeable and responsible with their own findings by involving in discussion and share their ideas with credible evidence.

This research found a consistent result with the study of Chia, Pei, and Yu [11]. The study revealed that the effect of FPBL strategy on improving students' learning performance was significantly higher than PBL. The teaching approach increased the students' motivation to solve the problem in the ill structured form. The utilization of the video lecture could improve students' self-efficacy. The students noted that the environment in a FPBL helps them encourage themselves internally. Lecture video allowed students to learn in their own way [4]. It provided the explanation about the subject matter, when the teacher was not present. That becomes the reason why a flipped classroom influences their willingness to have a self-directed learning session before they encounter the class. Therefore, they are ready to participate in the class activity and share what they have learned with the fellow learners and directly improving their critical thinking skills.

5. Conclusions

The FPBL had a meaningful impact on students' cognitive performance, improving independent learning and critical thinking skill. The findings provided the option for the nurse educators in Institute of Health Science Suaka Insan to develop the transformative learning strategy by implementing the new teaching method and rearrange the instructional design, especially teaching method or strategy to increase the attention of the students towards the learning material.

These findings emphasized on the power of technology to teach the millennials, hence the nurse educators have to adjust to the needs of the students and put high consideration to implementing new teaching strategies in their future classroom.

The study was limited to level III BS Nursing Students who were enrolled in renal system class 2016 of Intitute of Health Science Suaka Insan Banjarmasin. It was not involving large number of students who enrolled in other courses apart from renal system. During the experiment process, in order to avoid information contamination among non-experimental group and experimental group, the interval between tutorial I and II for both module was only 6 hours. Therefore, the students were reporting lack of time to finish the problem in hand, especially the students in non-experimental group. Only two learning materials were assigned for the research purpose and the students in two groups have learned about that topic before. Hence, the awareness of the participant in taking the post-test might be less serious. Apart from that, the researcher did not give an online test to the experimental group. Then, she could not ensure that the students really watched or read the learning material or not.

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