Learning Satisfaction toward PBL (Problem-Based Learning) and the use of ICT (Information Communication Technologies)

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Abstract
Problem-Based Learning (PBL) in Riau University Nursing School is implemented along with Curriculum-Based Competency. In order to improve the PBL process, intervention was made with the use of ICT within the process. This study aims to identify the effectiveness of PBL by combining it with Information Communication Technologies (ICT) through results of learning satisfaction scores. ICT were used to provide students with learning materials, related online sources, open questions for interactive group discussion and also delivering case scenarios for PBL. This research uses a quasy experimental one group (pretest-postest) design. Bivariate analysis was performed to examine the difference between 2 variables. Statistical tests of T-test dependent and its alternative, which was wilcoxon were used to evaluate satisfaction score difference between PBL and Teaching Method (TM) with or without using ICT. This study shows that first, satisfaction scores of combined method of PBL and Teaching Method (TM) with the use of ICT were higher than that without using ICT. Second, the highest average satisfaction score was PBL ICT (43,17), followed by TM ICT (39,66), PBL without ICT (37,59) and TM without ICT (32,61). Third, from bivariate analysis it is found that there were different satisfaction score toward any learning method applied. There was a difference satisfaction score between merger method using ICT and without using ICT (p value 0,000). There was a difference satisfaction score between PBL without ICT and TM without ICT (p value=0,000). There was a difference satisfaction score between PBL with ICT and TM with ICT (p value=0,000). There was also a difference satisfaction score between PBL with ICT and PBL without ICT (p value=0,000). There was a difference satisfaction score between TM with ICT and TM without ICT (p value=0,000). It can be concluded that first, satisfaction score toward any learning method using ICT is higher than that not using ICT with the highest was PBL that is using ICT. It is suggested to use ICT along with PBL implementation for better student satisfaction.
Keywords: PBL, teaching method, ICT, satisfaction

INTRODUCTION

Problem-based learning (PBL) is one of the active learning methods that is currently widely applied in the area of nursing and medicine education. Its use is not limited to the method itself, but is also considered as a total education strategy. In accordance with this, Barret et al (2) suggest that PBL should not only be used as a method of learning but also be included in the design of the curriculum.

Currently, PBL is widely used in Indonesia. However, it is used more frequently as a learning method rather than a competency-based curriculum (CBC). The PBL can be applied independently or in combination with conventional teaching method (TM). In order to implement PBL, several facilities are required such as adequate number of small sized classrooms, which depends on the number of students and adequate number of qualified learning tutors. These requirements most often become the obstacle to education institutions to implement PBL adequately (7).

Nursing School of Riau University have been implementing CBC since 2008. In 2012, PBL starts to be implemented as a method of learning in the nursing school and it continues to be used until now. Three studies have been performed to observe the effectiveness of PBL implementation in Riau University Nursing School. The first study was performed by Ernawaty (7) on paediatric nursing course topic. Ernawaty (7) identified several obstacles in the implementation of PBL. Limited number of lectures as tutors makes the implementation PBL quite difficult. Most often, the classroom activities do not run smoothly. Moreover, the classrooms size and layout does not support PBL activities as they are not initially designed to suit PBL activities. Ernawaty (7) also found that a slight modification on the PBL method, where the lecturers are replaced with capable students as the

PBL tutors or facilitators, was preferred by the students. The main finding of this research shows that the implementation of PBL does not guarantee better students' test scores than the other methods. This finding is in line with a research conducted by Beers (4) on the comparison between the effect of PBL and Teaching Method (TM) on students test scores. There was no difference found on the test scores from both methods. On the other hand, a research conducted by Rahmalia et al (13) in emergency nursing course topic at Riau University Nursing School shows quite different results where they claimed that the use of PBL improves the students' examination scores. This study also showed that the group size of 20 students can be an obstacle for the PBL implementation. The ideal number of students for each group in the implementation of PBL has been suggested Savery (14) and Eberlein, Kampmeir et al (6). They suggest that each PBL group should consists of 8 to 10 students with a facilitator to explore various issues of learning effectively. Another study conducted by Utomo & Utami (16) that aims to find out students experiences about PBL. This study indicates that through PBL student learn to communicate their ideas and motivate to read a lot of literature for PBL preparation. Students also feel satisfied after giving opinion at PBL session.

Another recent study that shows positive results on the implementation of PBL method was reported by Shin & Kim (15). They used meta-analysis in their study to show that PBL method gives positive effects on students' examination results and also increase students' learning satisfaction. Gurpinar et all (8) show in their study that PBL have higher exam score compare to that Teaching Method (TM). In addition to that, Gurpinar et al (9) showed that PBL method combined with e-learning (the use of information and communication technology, ICT) improves student test scores. It was also indicated that students had higher motivation when learning is incorporated with the use of computer and internet. However, another study that shows negative result is found by Alqahtani (1). This indicate that there is no significant difference in exam score between TM and blended learning that use ICT within.

The two different research results on the implementation effect of PBL method at Riau University Nursing School lead to the need of further intensive and careful studies to evaluate and validate the effectiveness of PBL method. The implementation of PBL method is questionable particularly when it is applied in an institution where human resources and facilities are not supportive. Since 2012, Riau University Nursing School has developed several tutorial rooms for implementing PBL method, although not all of them are considered appropriate tutorial rooms in term of facilities. The relatively high level of noise and room temperature disturb the learning environment and reduce students' learning mood. Moreover, as suggested from the previous study, the use of fresh graduate students to solve the problem of lack of lecturers as tutors needs to be supported especially by the school management.

Recent trends in health education indicate that PBL is a pillar of a modern education. However, the implementation needs modification and re-planning of the current teaching method as well as the curriculum. If it is possible, the use of technology such as multimedia or ICT (Information Communication Technology) needs to be experimented. This research evaluates the implementation of PBL method in nursing management course topic in combination with the use of ICT. The effects of a pedagogic learning process through the use of web media is observed and quantitatively evaluated.

Since 2012, the A nursing program in Nursing School Riau University has been delivered using a Problem-Based learning (PBL). The effectiveness of the PBL has not been properly evaluated. In order to enhance the learning process, action or intervention to use ICT within were made to the nursing management course topic. However, the PBL applied is a hybrid method where PBL is not fully adopted but along with the use of TM. The study compares the difference in learning satisfaction score between PBL and TM method in combination with ICT in nursing management course topic. In the future, it is hoped that this research become a simulation or sustainable model development of the PBL method with the use of ICT as one of the interactive media.

RESEARCH METHOD

This research uses a method of quasi-experimental one group (pretest-posttest) design. One group (pretest-posttest) design is a type of quasi experimental design when only one group is involved as according to Whittemore & Grey (19). Therefore, there is no control group. Data are collected before and after the intervention using ICT to find out its effectiveness.

The populations in this study were all 72 students who take nursing management topic in the second semester in 2015. A set of questionnaire on learning satisfaction is used as the instrument in this research. The questionnaire is validated through content validity. The Content Validity Index (CVI) of this questionnaire is 0,82. It can be concluded that each item of the questionnaire are valid. According to Polit & Beck (17),each item is considered valid if it has CVI more than 0,80.

As stated by Polit and Beck (18) that privacy right is self-determination. Hence, Privacy, confidentially and anonymity are also taken seriously in this study. In addition to this, some information that should be given before taking the consent of research participation, are briefly and clearly explained particularly about the aim of

the study, participant right to refuse and withdraw from the study, the researcher's responsibility, the benefit, available risks and treatments as well as the guarantee of privacy and confidentiality of participants. Participants also have the right to withdraw from the study without having to specify any reason. During the implementation of the research, the principle of non-maleficence is also considered. The participant should be ensured for having no harm as explained by Polit & Beck (18).

For the analysis of the collected data, statistical tests that aims to understand the difference between the two variables are used. The statistical tests used are dependent T-test and Wilcoxon (18) to see the differences in satisfaction scores toward applied learning methods.

RESULTS AND DISCUSSION

This section will be devided into two parts, which are univariate and bivariate analysis. This study aims to examine the learning satisfaction toward PBL and TM that are combining with the use of ICT. Here is the description of the implementation of ICT toward PBL and TM method.

Table 1
The implementation of ICT in applied learning methods

Activities	Duration
Week I (without ICT) ▪ 1 time PBL ▪ 4 times Teaching Method (TM)	▪ 6 hours tutorial (tutor 1, tutor 2, pleno) and 4 hours self-study ▪ 8 hours
Week II (with ICT) ▪ 1 time PBL ▪ 3 times Teaching Methods (TM)	▪ 6 hours tutorial (tutor 1, tutor 2, pleno) and 4 hours self-study ▪ 6 hours

A. Univariate

In this univariate analysis, each method will be evaluated through its satisfaction score. It aims to describe learning satisfaction score toward PBL without ICT, TM without ICT, PBL with ICT, TM with ICT and also its merger which mean a week learning of PBL and TM (PBL + TM without ICT) without using ICT and another week not ICT (PBL + TM with ICT). Table 2 shows the variation of students' learning satisfaction scores for several applied learning methods.

Table 2
Variation of students' learning satisfaction scores based on learning method applied (n=72)

Variable	Mean	Median	SD	Skewnes	Min-max	95% CI mean
PBL Non ICT	37,59	38	5,341	-0,975	18-47	36,30-38,88
TM Non ICT	32,61	33,5	6,9	-0,454	15-44	30,93-34,29
PBL ICT	43,17	43	3,15	-0,069	37-49	42,40-43,93
TM ICT	39,66	41	5,2	-0,510	26-49	38,40-40,92
PBL + TM (Non ICT)	70,20	71	10,995	-0,640	36-90,21	67,54-72,86
PBL + TM (ICT)	82,83	83,5	6,9	-0,175	68-96	81,16-84,496

Table 7 shows that the average satisfaction scores of PBL without ICT (PBL non-ICT) was 37.59 (95% CI: 36.30 to 38.88) with the lowest score was 18 and the highest score was 47. The results of the estimation interval can be concluded that 95% believed. The satisfaction scores of PBL without ICT was between 36.30 and 38.88.

The average satisfaction score of TM without ICT (TM Non-ICT) was 32.61 (95% CI: 30.93 to 34.29) with the lowest score was 15 and the highest score was 44. The results of the estimation interval can be concluded that 95% believed that the satisfaction score against TM without ICT was between 30.93 and 34.29.

In addition to that, the average score of satisfaction of PBL with ICT (PBL ICT) was 43.17 (95% CI: 42.40 to 43.93) with the lowest score was 37 and the highest score was 49. The results of the estimation interval concludes that 95% believed that the satisfaction score against PBL with ICT was between 42.40 and 43.93.

It is also shown that the average score of satisfaction TM with ICT (TM ICT) was 39.66 (95% CI: 38.40 to 40.92) with the lowest score was 26 and the highest score was 49. The results of the estimation interval concludes that 95% believed that the satisfaction score against TM with ICT was between 38.40 and 40.92.

From Table 7, it can be seen that the average satisfaction scores of the combination PBL and TM without ICT (PBL + TM without ICT) was 70.20 (95% CI: 67.54 to 72.86) with the lowest score was 68 and the highest score was 96. The result from the estimation interval can be concluded that 95% believed, the satisfaction score for that combination methods without ICT was between 67.54 and 72.86.

From the analysis of univariate satisfaction scores, it can be concluded that first, satisfaction scores of

combination method (PBL and TM) incorporating ICT in the learning process was higher than without incorporating ICT. Second, the highest average value of learning satisfaction score was obtained when using the learning method of PBL with ICT and then followed by TM with ICT, PBL without ICT and TM without ICT respectively.

These findings is in agreement with several other research findings. Shin & Kin (15) found that traditional PBL had an average satisfaction scores higher than a teaching method (TM). Furthermore, when combined with the use of ICT, Gufinar et al (9) found the PBL with ICT has the highest satisfaction scores. A lot debate regarding the use of ICT as a learning method replacing conventional learning in classroom. Although, the finding of this research supports the use of ICT, however, it does not mean replacing PBL or TM with ICT or e-learning. It is strongly suggested to take the advantage of ICT as a medium of communication between students and lecturers for better learning outcomes. Basir et al (3) argue that PBL can improve the confidence of the students. Along with the implementation of ICT, therefore, it also can improve the capability of the students to do self study.

The use of ICT in this study will provide a more comprehensive learning model because it involves the use of computers and the internet. Mikre (12) defines ICT as the use of computers and the internet to deal with the problem of communication of information for learning purposes. Synonym use of ICT in education, among others, is an e-learning or techno-pedagogies.

ICT were used in this study to provide the students a case scenarios, also online resources as well as discussions and related learning materials. Interactive group discussion by giving open-ended questions is also provided. The question is used as a stimulus for students to read related articles provided before the class begin.

Donelly (5) argues that the use ICT in learning process is not indicate by giving the students the learning material through the internet. There should be a discussion or communication session. This study is already picturing the use of ICT because it is not only providing the learning materials to the students, but also giving a chance to the students to have an interactive group discussion session.

B. Bivariate

This bivariate analysis will picture the comparison between two learning methods that are applied in this study. It try to see the difference between PBL and TM without using ICT, PBL and TM with the use of ICT, PBL Non ICT and PBL ICT, TM Non ICT and TM ICT and also its merger comparison of a week learning of PBL and TM (PBL + TM Non ICT) without using ICT and another week using ICT (PBL + TM with ICT).

Table 3

Students' learning satisfaction score differences between applied learning methods (n=72)

Variable	Mean	Test	P value
PBL Non ICT compared to TM Non ICT	37,59 32,61	T test dependent	0,000
PBL ICT compared to TM ICT	43,17 39,66	Wilcoxon	0,000
PBL Non ICT compared to PBL ICT	37,59 43,17	T test dependent	0,000
TM Non ICT compared to TM ICT	32,61 39,66	Wilcoxon	0,000
PBL+TM (Non ICT) compared to PBL+TM (ICT)	70,20 82,83	T test dependent	0,000

Table 3 showed that the satisfaction score of PBL without ICT was higher than TM without ICT (average scores of PBL (non-ICT)> TM (Non ICT)). Based on this analysis, it can also be deduced using the t test dependent on p value 0.05, that there was no difference in satisfaction scores of PBL without ICT compare to TM with ICT (p value 0.000).

Moreover, it is also shown that the average satisfaction scores of PBL with ICT was higher than TM with ICT (average scores PBL (ICT)> TM (ICT)). By using the Wilcoxon test p value of 0.05 can be concluded that there was difference in satisfaction scores on PBL with ICT compare to TM with ICT, with PBL is higher (p value 0.000).

The average satisfaction scores of PBL ICT was higher than PBL without ICT (average scores PBL (ICT)> PBL Non ICT). By using the t test dependent on p value of 0.05 can be concluded that there was a difference in the satisfaction scores with PBL without ICT compare to PBL with ICT (p value 0.000).

The average satisfaction scores in TM ICT was higher than TM without ICT (average scores TM (ICT)> TM (Non ICT)). By using the Wilcoxon test p value of 0.05 can be concluded that, there was a difference in satisfaction scores bertween TM without ICT with TM with ICT (p value 0.000).

Table 9 shows that the average score of satisfaction of a week combination of PBL and TM methods using ICT was higher than without ICT (average scores PBL + TM (ICT)> PBL + TM (non-ICT). By using the t

test dependent on p value 0,05, it can be concluded that there was a difference in satisfaction scores between combination method without ICT and combination method with ICT (p value = 0.000).

Based on the bivariate analysis of satisfaction scores, several conclusions can be drawn. First, in all the bivariate tests, it is shown that there are differences in satisfaction scores for all compared learning methods. Second, on incorporating ICT with any learning methods, student satisfaction is higher than without incorporating ICT. Third, students' satisfaction for the PBL method was higher than for TM either with incorporating ICT or without incorporating ICT.

These findings are align with a qualitative research conducted by King et al (11), who examined the relevant type of interaction that is facilitated by interprofessional with e- problem-based learning (ePBL). The use of e-learning or can be referred to ICT in this study shows the results may facilitate the small group interaction and also facilitate interaction on those who are less expert or novice. The study also compared the traditional PBL and e-PBL. Furthermore, King et al (11) stated, that health professionals must be able to interact with the information obtained through technology. In this study, it is trained as early as possible through a process in blended learning using ICT. According to King et al (11), the use of e-PBL in the learning process can facilitate difficulties in communication. However, King et al study used sound in the virtual classroom whereas this study did not. This study only uses ICT as a medium of communication with students to support the process of PBL. Therefore, the method is still considered as traditional PBL accompanied by ICT. ICT in this case is used to deliver media teaching materials, related teaching materials and resources as well as questions for interactive group discussion.

The finding of this study are also consistent with the results of research conducted by Gurfinar et al (9) where it was found that majority of students have a very high satisfaction score towards PBL accompanied by ICT. Moreover, it is also stated that the opportunity to access knowledge in a short time without any dependence on the class and the teacher might lead to high student satisfaction towards PBL accompanied by ICT.

This study indicates that the average satisfaction PBL without ICT is higher compare toward TM without ICT, this difference was statistically significant (p value <0.05). These results are consistent with the results of the meta-analysis by Shin & Kin (15), who found that traditional PBL has a positive effect on satisfaction compare to TM. However, this study did not align with learning methods satisfaction study conducted by Hernando et al (10), who found that 55% of students prefer a teaching methods or TM compared to PBL. However, Hernando et al (10) showed that, students perceive high satisfaction in the learning process of PBL include content, tutorial process, tutor and student roles. This study concluded that PBL can improve communication skills of students.

CONCLUSIONS

The analysis of univariate satisfaction scores concludes that first, satisfaction scores of combination method incorporating ICT in the learning process was higher than without incorporating ICT. Second, the highest average value of learning satisfaction score was obtained when using the learning method of PBL ICT and then followed by TM with ICT, PBL without ICT and TM without ICT respectively.

Bivariate analysis of satisfaction scores yields several findings; first, in all the bivariate tests, it is shown that there are differences in satisfaction scores for all compared learning methods. Second, on incorporating ICT with any learning methods, student satisfaction is higher than without incorporating ICT. Third, students' satisfaction for the PBL method was higher than for TM either with incorporating ICT or without incorporating ICT.

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