# A COMPARISON OF PROBLEM-BASED LEARNING AND LECTURE-BASED LEARNING IN INTERNAL MEDICINE COURSE AT THE SCHOOL OF MEDICINE AND PHARMACY – THE UNIVERSITY OF DANANG

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**Abstract** - Problem-based learning is a new effective teaching method but has not been applied at the University of Danang - School of Medicine and Pharmacy (UD-SMP) yet. This study assesses the level of knowledge and the satisfaction of students after studying Problem-based learning method in comparison with the traditional one, called "Lecture-based learning". The results of the study shows that Problem-based learning improved students' outcomes compared to the traditional method in terms of average scores (9.2 versus 8.6, $p < 0.05$). Students are more satisfied with Problem-based learning than Lecture-based learning because of its benefit in improving both hard and soft skills.

**Key words** - Problem-based learning (PBL); lecture-based learning (LBL)

## 1. Introduction

Problem-based learning (PBL) is a competency-based teaching and training method [1], widely applied in many European and American countries [2]. In addition to learning about the lesson content, PBL also helps learners cultivate critical thinking, develop communication skills, create an environment for collective work, and stimulate students' initiative to seek information, self-study, and form problem-solving ability [3], [4], [5]. However, PBL has not been widely applied in medical schools in Asia [6], [7] as well as in Vietnam [8]. To facilitate the practice of PBL to benefit not only students but also lecturers and tutors to improve their teaching skills, we conduct the study "Comparing teaching methods problem-based and traditional teaching in Internal Medicine at UD-SMP with the following objectives: 1. Compare the level of knowledge gained by students between the PBL group and LBL group. 2. Assess the level of satisfaction of students between two group.

## 2. Methods

### *2.1. Subjects*

The study was conducted with all fourth-year medical students at our school who took the Internal medicine course in the second semester for 2021 (n=99). They were randomly assigned into two groups: 52 students of the interventional group participated in PBL courses while 47 students of the control group participated in traditional lectures (LBL group).

### *2.2. Procedure*

We chose three lectures from the Gastroenterology section for LBL class, including: Gastric Ulcer, Acute Pancreatitis, and Liver Cirrhosis. After grouped those lectures into two topics: Approaching epigastric pain and Approaching ascites – abdominal pain, we used written problems and clinical cases for the problem-based procedure.

***Table 1.*** *Lectures and topics selected*

| No | Traditional Lecture | Number of periods | Topic of PBL | Number of periods | |
|---|---|---|---|---|---|
| | | | | Session 1 | Session 2 |
| 1 | Gastric Ulcer | 2 | Approaching epigastric pain | 1 | 1 |
| 2 | Acute Pancreatitis | 3 | | | |
| 3 | Liver Cirrhosis | 3 | Approaching ascites – abdominal pain | 1 | 1 |
| | | | Introduction session | 1 | |
| | | | Summary session | | 1 |
| | **Total** | **8** | | | **6** |

In the LBL class, students read, listened to the lecture, and took notes, the lecturer assigned homework to student after each class as usual. Each week, students spent a session of 2-3 periods, 45 minutes every period. The total teaching knowledge was delivered in 8 periods.

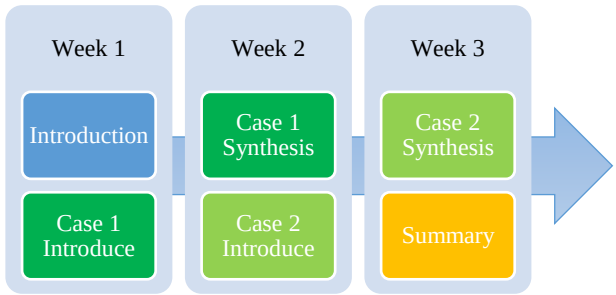


***Figure 1.*** *Procedure during the course*

In the PBL class, students were divided into five small groups. Every week of the course includes one PBL tutorial lasting 90 minutes. Every tutorial is split into two 45-min-sessions. During the first 45 minutes, the synthesis of the problem from the previous week is performed. In the second 45 minutes, the next problem is introduced.

The first and last weeks of the course are exceptions. During the first 45 minutes of the tutorial, the tutor and group members get to know one another as the tutors also explain the PBL idea. In the second part of the final tutorial, the group reviews the entire course as a whole.

### *2.3. Instrumentation*

Both groups were tested for their knowledge level before (pre-test) and after learning (post-test) by the same test (Appendix 1). The content of the questions is built

from basic knowledge according to the traditional curriculum and references from PBL documents [9]. The format of the test is multiple choice. After the course, both groups were also surveyed for their satisfaction using a 5-point Likert scale questionnaire (1. Strongly disagree, 2. Disagree, 3. Normal, 4. Agree, and 5. Strongly agree). The questionnaire was built based on references from similar studies applying PBL at medical universities around the world [10], [11], [12] including questions about the demographic characteristics of the students participating in the study; students' assessment of the lectures, the way of working in groups; The impact of teaching methods on learning effectiveness. The questionnaire was then distributed to a group of 10 students to assess the applicability, validity, and intelligibility of the questions and answers. Then, based on the responses from the survey respondents, the questionnaire was adjusted accordingly (Appendix 2).

### *2.4. Data analysis*

The data were processed using the statistical software SPSS 19.0. The measurement data were presented as mean (± SD) or median and interquartile range. We used t-test to examine the differences between the mean test scores in the examinations comparing both teaching methods. The chi-square test was used to compare the effects of teaching between two groups and examine the categorical data. Statistics are considered significant at $p < 0.05$.

## 3. Results

### *3.1. Characteristics of age, gender and pretest score between two groups of students*

***Table 2.*** *Comparison of general data between two groups of students*

| | PBL group (n=52) | Control group (n=49) | p value |
|---|---|---|---|
| Age/year (mean ± SD) | 22.2 ± 0.7 | 22.3 ± 1.2 | > 0.05 |
| Female (%) | 55.9 | 44.1 | > 0.05 |
| Pre-test score (mean ± SD) | 3.4 ± 0.8 | 3.2 ± 0.9 | > 0.05 |
| - Poor performance (%) | 80.4 | 85.5 | > 0.05 |
| - Below Average performance (%) | 17.9 | 14.5 | |
| - Average performance (%) | 1.8 | 0 | |

There was no statistical difference between the two groups in terms of gender, age, and pre-test score ($p > 0.05$). Most students only scored poorly on the pre-test.

### *3.2. Comparison of knowledge assessment results between two groups*

***Table 3.*** *Self-study time in pre-class, post-test score, post-test score difference from pre-test score between two groups of students*

| | PBL group (n=52) | Control group (n=49) | p value |
|---|---|---|---|
| Self-study time/min (median ± IQR) | 60 ± 45 | 50 ± 30 | |
| Post-test score (mean ± SD) | 9.2 ± 1.1 | 8.6 ± 1.4 | < 0.05 |
| Post-test score difference from pre-test score (mean ± SD) | 5.8 ± 1.3 | 5.4 ±1.5 | > 0.05 |

The post-test score of the interventional group is higher than the control group and the difference is statistically significant ($p < 0.05$).

### *3.3. Comparison between the two groups of students' satisfaction with the curriculum*

#### *3.3.1. In terms of lecture/tutor and teamwork interaction*

***Table 4.*** *Interaction with lecturer/tutor and teamwork assessment*

| | PBL group (n=52) | Control group (n=49) | p value |
|---|---|---|---|
| Enough time for interaction with lecturer/tutor (%) | 76.9 | 85.1 | >0.05 |
| Good performance of lecturer/tutor (%) | 73.1 | 63.8 | >0.05 |
| Agree and strongly agree about the lecturer/tutor (%) | 67.3 | 61.7 | >0.05 |
| Enough time for teamwork in class (%) | 76.9 | 55.3 | >0.05 |
| Enough classroom interaction (%) | 67.3 | C | >0.05 |
| Agree and strongly agree about the teamwork (%) | 55.8 | 38.3 | >0.05 |
| Students are interested and focused on the lesson (Agree and strongly agree, %) | 53.8 | 44.7 | >0.05 |
| Overall satisfied with the class (Agree and strongly agree, %) | 57.7 | 48.9 | >0.05 |

Students in PBL class tended to be more satisfied with the lecture/tutor performance or teamwork activity than in LBL class. The overall satisfaction degree of the interventional group was 57.7%, which was higher than the control group (48.9%). However, the differences were not statistically significant ($p > 0.05$).

#### *3.3.2. Self-effectiveness evaluation between the two groups*

***Table 5.*** *Comparison of self-evaluation between the two groups*

| | PBL group (n=52) | Control group (n=49) | p value |
|---|---|---|---|
| Wild range knowledge and clinical skills supply (Agree and strongly agree, %) | 71.2 | 51.1 | < 0.05 |
| Basic knowledge mastery (Agree and strongly agree, %) | 57.7 | 53.2 | > 0.05 |
| Ability to analyze and solve problems (Agree and strongly agree, %) | 50.0 | 53.2 | > 0.05 |
| Helpful in motivation and interest (Agree and strongly agree, %) | 55.8 | 40.4 | < 0.05 |
| Self-study ability (Agree and strongly agree, %) | 69.2 | 46.8 | < 0.05 |
| Communication skill, performance, and critical thinking skill improvement (Agree and strongly agree, %) | 42.3 | 31.9 | < 0.05 |

The self-evaluation of the interventional group was significantly higher than the control group in some aspect. The students felt that the PBL was helpful in enhancing

their capacity for self-study, communication skill, performance, and critical thinking. Additionally, students in the PBL group reported greater comprehension of fundamental concepts, and the problem learning had a notable positive impact on their motivation and interest.

## 4. Discussion

### *4.1. Characteristics of age, gender and entrance achievement (pretest score) between two groups of students*

We found no statistically significant differences in age, gender, pre-test scores (Table 2) between two groups. In addition to the fact that the two groups were randomly selected by lottery, the similarities in age, gender and entrance achievement of the two groups allowed us to make a comparison of the learning results as well as the student's satisfaction after the course to ensure the reliability of the statistical results.

### *4.2. Comparison of knowledge assessment results between two groups*

PBL improves student learning outcomes (learning and knowledge retention) compared to traditional learning methods in medical education: The mean score of students learning by PBL method is higher than that of the group. students learn by traditional lecture method (9.2 versus 8.6 points, $p < 0.05$). The average score improvement of the PBL class is also higher than that of the traditional class (5.8 points compared to 5.4 points), however, the difference is not statistically significant, possibly due to the pre-test scores. of the PBL group is higher than that of the traditional group (this difference is not statistically significant) leading to the difference between post-test and pre-test that will not be statistically significant even though the difference in post-test scores is significant.

Many studies comparing the level of improvement in learning outcomes, scores of the PBL method compared with the traditional method give similar results. Author Xu, after searching and selecting 9 high-quality studies for inclusion in a meta-analysis, noted: The mean score (95% confidence interval) of the total PBL program test score was significantly higher than 0.89 (0.52 -1.26) compared to the traditional class at the end of teaching the cell biology module 0.53 (0.29-0.78) [13]. Gurpinar's study, when comparing the average scores obtained on 25 questions on the knowledge test in the public health class, found that the PBL group scores higher than the traditional group (65.0 versus 60.5). The students of the PBL group had higher knowledge scores in 7/9 topics. But the difference between the mean scores of the groups was only statistically significant in two topics, "health management" and "chronic disease". In this regard, the author also explains why the knowledge scores of students in the PBL group are significantly higher, possibly because these students have more opportunities such as observations in field studies, store work or give a presentation to research on these two topics compared to students in the other group. They underwent a two-week training period at a "community health center" at the end of the first year and observed the health center's services and prepared a structured form regarding the procedures. of the medical center. They also study in "public health centers" as small groups of two students every two weeks during their third year of school and complete composite forms on topics they have studied. research [14]. Hwang studied 71 second-year nursing students in a three-year nursing program in Korea, including 35 students from the PBL group and 36 from the traditional teaching group. The PBL program consists of 7 topics based on analysis of relevant learning content and clinical situations. Students in the PBL group gained more knowledge and were more motivated to learn than students in the traditional teaching group. It is worth noting that all PBL students who scored higher and lower than the pre-course average experienced a significant increase in their post-scientific test scores. In contrast, in the lecture group, only students with higher-than-average scores had a significant increase in post-science test scores. Motivation to learn was significantly higher in the PBL group when compared with the lecture group [15].

In this study, we think that this may be partly due to the higher time spent by students in self-study and pre-study sessions in PBL class than in the traditional class (60 minutes compared to 50 minutes). (Table 3). Due to the design of PBL lectures, students had to spend more time on this problem, especially in group discussions to solve the problems posed by the lecturer. In this study, the lecturer poses a problem. Although the scope of the problem is only part of the traditional lecture, every group and every student in the group must spend time anyway to study the theoretical knowledge surrounding the problem. This allows students to deepen their understanding of the subject matter they are studying. However, it may also be because the PBL teaching method is more effective than the traditional lecture-based teaching method. However, an important reason for the improvement of students' scores can be attributed to the requirements of the PBL method itself. PBL forces students to change the way they study, arrange more study time before going to class, and be more active in learning.

However, PBL has not changed students' attitudes towards learning significantly. Meo's study based on a comparative cross-sectional questionnaire conducted at the Department of Physiology, Medical College, King Saud University, Riyadh, Saudi Arabia, from July 2009 to January 2011 showed that students followed PBL program students have more positive perceptions of teaching and learning, knowledge and skills, outcomes of their course materials, and satisfaction than students in a traditional medical school setting. In this study, 2 different medical universities were selected; Two equal groups of first-year medical students were selected: one under the traditional program, the other under the PBL program. They are taught in the laboratory respiratory physiology and lung function according to their curriculum for a period of two weeks. At the end of the research period, using the Likert scale to assess students' perceptions of satisfaction, learning environment, teaching and learning methods, knowledge and skills and results of course materials about effectiveness of problem-based learning methods compared to traditional

methods. Research results show that students using the PBL program achieve a slightly higher cognitive score (24.10 ± 3.63) than students using the traditional program (22.67 ± 3.74).. However, the difference in perception did not reach statistical significance [16]. Thus, changing students' perceptions and attitudes is more difficult, and needs to be renewed or adjusted to bring about more positive effects.

### *4.3. Comparison between the two groups of students' satisfaction with the curriculum*

#### *4.3.1. In terms of lecture/tutor and teamwork interaction*

Overall assessment of students in the PBL class tended to be more satisfied with the instructor's presentation than in the traditional class (Table 4). They argue that the study found that the instructor's transmission in PBL sessions is easier to understand (73.1% vs 63.8%) and is more interesting and stimulating than the traditional class (13.5% vs 4.3%) but there is no statistically significant difference. However, the study recorded that the students in PBL class said that the interaction and exchange with the instructor during the lesson were higher than that of the traditional class (23.1% vs 14.9%). The difference is not statistically significant.

Bindayna surveyed the effectiveness of the PBL microbiology practice module on a small group of 110 students at the Faculty of Medicine, Arabian Gulf University, Bahrain, and found that more than 50% of the students agreed or strongly agree that the time spent on PBL is moderate, the topics discussed are relevant, the lecturer's presentations are clear, the pre-sessional tutorials are brief and supportive of the learning. Only 38% of students thought that the lectures were lengthy [3].

This result is different from our study. This is a limitation of the study when designing time for class lectures with lecturers and/or teaching assistants. Therefore, in the design of classroom lecture time of PBL class, it is necessary to arrange longer interaction time between lecturers and students.

The study showed that students recorded more time spent on discussion - group work in the PBL class sessions than in the traditional class (76.9% vs 55.3%, $p > 0.05$). However, the difference was not statistically significant (Table 4). The interaction and cooperation between members in the PBL class is also said to be more adequate than in the traditional class (67.3% compared to 55.3%), but the difference is not statistically significant. Students in the PBL class had a higher number of students agreeing and strongly agreeing than the traditional class, saying that the PBL program facilitates more effective teamwork (55.8 and 38.3%, $p > 0.05$). However, the difference is not statistically significant. We also noted that there was no statistically significant difference in the discussion activity among members during the learning process between the two PBL and traditional classes.

Using PBL in medical training, especially in the laboratory, helps promote active learning. Teamwork is a powerful tool in the educational process, providing students with insights that allow them to gain practical skills. Both traditional and PBL students must implement techniques and master concepts in specific time periods using similar resources. However, the PBL approach offers more opportunities for students to develop skills, understand concepts, and practice applications than the traditional approach. Students gain knowledge of the entire scientific method in an appropriate and engaging environment. In addition, students often prefer experience to pure theory. Group discussions are used in lab sessions because they engage students in learning and encourage them to dig deeper and can help students take more responsibility for their learning. The active discussion approach in microbiological practice has also been shown to have a positive effect on the learning process. The use of situations allows learners to think, visualize changes, and link knowledge from several fields to solve problems and justify their views. Bindayna's research documented students who found the components of a PBL session to be extremely helpful. The responses serve as an internal trigger to improve the quality of the session. The use of PBL in a laboratory setting promotes active learning. In fact, when combined with case-based scenarios, practice sessions enhance student understanding and help improve student outcomes [3].

#### *4.3.2. Self-effectiveness evaluation between the two groups*

PBL students note that the teaching method provides a wide range of knowledge and skills. The PBL class had a higher number of students agreeing and strongly agreeing that this teaching method provides more diverse information about knowledge and skills than the traditional class (71.2% vs 51.1%), while the number of students who disagreed and strongly disagreed with the PBL class was significantly lower than that of the traditional class (1.9% versus 12.8%). The difference was statistically significant ($p < 0.05$) (Table 5). However, there is no clear difference between the two classes of PBL and traditional students with respect to the following questions: 1. I understand the theory of the lesson after the lesson; 2. I have the ability to apply it to a clinical situation; 3. I am more interested and focused in the lesson; 4. After the course, I achieved the course objectives; 5. I am satisfied with this teaching method.

However, the study found that students in the PBL class who agreed and strongly agreed were more interested and focused in the lesson than students in the traditional class (53.8% versus 44.7%), while the students in the PBL class disagreed and strongly disagreed less than in the traditional class (7.7% versus 17.0%). However, there is no statistically significant difference. After the course, students in the PBL class agreed and strongly agreed that I achieved the course objectives higher than the traditional class (51.9% vs 44.7%) and disagreed and strongly disagreed. agree is lower than the traditional class (5.8% vs 10.6%) but there is no statistically significant difference. After the course, students in the PBL class agree and strongly agree that the satisfaction with this teaching method is higher than that of the traditional class (57.7% compared to 48.9%) and the number of disagree and strongly disagree mean is lower than the traditional

class (5.8% vs 12.8%) but there is no statistically significant difference.

There is no statistically significant difference in whether this method is suitable for Internal Pathology between the two classes of PBL and the traditional one. Students in the PBL class agree and strongly agree that it is recommended to apply the PBL learning method to other subjects with a higher rate than in the traditional class (53.8% versus 40.4%), while the percentage The percentage of disagree and strongly disagree of the PBL class encouraged to apply the PBL learning method to other subjects with a lower rate than that of the traditional class (9.6% versus 14.9%). However, the difference is not statistically significant.

Gurpinar's research also found that the majority of students had a positive attitude after learning the PBL method. Satisfaction survey of 728 first-year and second-year medical students after having experienced PBL under three different curricula from three universities in Turkey (Pamukkale Medical University, Akdenix Medical University and Akdenix Medical University) Suleyman Demirel School of Medicine). These students were invited to participate in the survey using a 20-question self-completed questionnaire, using the Likert scale. The obtained results show that 64.6% of students feel that they understand the lesson more broadly and comprehensively when learning PBL, and the knowledge is also understood more deeply and remembered longer [4].

Regarding the impact on self, when comparing the PBL method with the traditional method, this study found that the most obvious difference was the effectiveness of the PBL method: 55.8% of PBL class students agreed and strongly agree that the PBL method helps them to learn more creatively than the traditional class (40.4%), while only 1.9% of the students in the PBL class disagree and strongly disagree that the PBL method helps them Creative learning is lower than the traditional class (17.0%). The difference was statistically significant ($p < 0.05$). 69.2% of students in the PBL class agree and strongly agree that the PBL method motivates them to learn more than the traditional class (46.8%), while only 1.9% of the students in the PBL class disagree and strongly disagree that the PBL method motivates them to learn lower than the traditional class (17.0%). However, the difference was statistically significant ($p < 0.05$). And 42.3% of students in the PBL class agree and strongly agree that after the PBL method course, their communication, presentation, and critical skills improved higher than in the traditional class (31.9%)., while only 5.8% of PBL class students disagree and strongly disagree that after the PBL method course, their communication, presentation, and critical thinking skills improved lower than in the traditional class (23.4%). The difference was statistically significant ($p < 0.05$).

Surveying 104 4th-year medical students, Karachi Medical and Dental University, Habib noted that 79% were very interested in this method. Among PBL advocates, 74% (61 out of 82) were motivated to learn; 76% (62 out of 82) were encouraged to do research after undergoing PBL sessions; 77% (63 out of 82) feel that they can improve their communication skills while 78% (64 out of 82) of students can identify gaps in their knowledge after attending the sessions. PBL [5]. Yaday's study in Nepal showed that about 85.5% of the participants agreed that PBL is an interesting teaching and learning method. Up to 86.7% accept that PBL is a method of interaction and mutual learning and improves self-directed learning (83.2%) [17]. Research by Iwatsuki evaluating the learning attitude of students of the Faculty of Medicine - Nagoya University also shows that the majority of students are satisfied after studying PBL, in which more than 50% of students agree that PBL increases understanding and enjoy learning. In addition, he also noted that 82.5% of PBL class students agree that PBL helps students develop soft skills [18]. Research by Nguyen Thi Thanh Phuong also shows that both students and lecturers are interested in the PBL method [19].

However, it is worth noting that there is no difference between the PBL class and the traditional class as students consider this method to help themselves analyze and solve problems. Many other studies showed that PBL also yielded this result. Koh et al. The analysis of the influence of PBL during medical school on the competence of doctors after graduation also noted the positive impact of PBL mainly in social and cognitive aspects [20]. Therefore, besides designing lectures and arranging reasonable time, guiding students to participate in the PBL program should also be paid more attention before implementing PBL teaching.

## 5. Conclusion

This research aims to compare the effectiveness of PBL and LBL in medical students. It was discovered that students in the traditional course performed lower score than those in the PBL course (9.2 versus 8.6 points, $p < 0.05$). Moreover, students are more satisfied with the PBL method than the traditional one because of its improvement in learning efficiency: Wide range knowledge and clinical skills supply, helpful in motivation and interest, self-study ability, communication skill, performance, and critical thinking improvement. With all that advantages, we recommend applying PBL more in many other subjects to bring effectiveness to medical education.

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