

PBL DISCUSSIONS AND EXAM PERFORMANCE : DOES STUDENT ENGAGEMENT AFFECT CBT EXAM RESULTS?

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ABSTRAK

Penelitian ini dilakukan untuk menyelidiki hubungan antara keterlibatan mahasiswa dalam diskusi tutorial Pembelajaran Berbasis Masalah (PBL) dan prestasi akademik mereka yang diukur dengan Ujian Berbasis Komputer (CBT) dalam bentuk Soal Pilihan Ganda (MCQ). Permasalahan yang mendasari penelitian ini adalah bahwa partisipasi mahasiswa dalam sesi PBL sering diasumsikan berkontribusi secara signifikan terhadap pengembangan kemampuan berpikir kritis dan pemecahan masalah, yang pada gilirannya dapat memengaruhi prestasi akademik. Namun, bukti empiris mengenai sejauh mana pengaruh ini masih terbatas, terutama di kalangan mahasiswa kedokteran tahun pertama yang masih beradaptasi dengan strategi pembelajaran mandiri. Pendekatan kuantitatif dengan desain korelasional digunakan untuk mengatasi masalah ini. Penelitian ini menggunakan metode potong lintang yang melibatkan 50 mahasiswa kedokteran tahun pertama sebagai sampel penelitian. Data dikumpulkan dari skor mahasiswa dalam diskusi tutorial PBL dan ujian blok CBT. Analisis statistik dilakukan menggunakan ANOVA satu arah untuk menentukan hubungan antara kedua set skor tersebut. Hasil penelitian menunjukkan korelasi positif dan cukup kuat antara skor tutorial dan kinerja CBT di Blok 1.1 dan Blok 1.3, dengan koefisien korelasi masing-masing $r = 0,523$ dan $r = 0,559$. Temuan ini menunjukkan bahwa partisipasi aktif dalam sesi PBL berpengaruh positif terhadap hasil ujian di blok pembelajaran tertentu. Sebaliknya, tidak ditemukan hubungan signifikan antara skor tutorial dan kinerja CBT di Blok 1.2 ($P > 0,05$), yang menunjukkan variabilitas dampak PBL di berbagai mata pelajaran. Kesimpulannya, aktivitas mahasiswa dalam tutorial PBL berperan penting dalam meningkatkan hasil pembelajaran, meskipun pengaruhnya dapat bervariasi tergantung pada konten dan konteks blok pembelajaran.

Kata kunci : CBT, diskusi tutorial, mahasiswa kedokteran, pembelajaran berbasis masalah

ABSTRACT

This study was conducted to investigate the relationship between student engagement in Problem-Based Learning (PBL) tutorial discussions and their academic achievement as measured by Computer-Based Testing (CBT) in the form of Multiple Choice Questions (MCQ). The issue underlying this research is that student participation in PBL sessions is often assumed to contribute significantly to the development of critical thinking and problem-solving skills, which in turn may affect academic performance. However, empirical evidence on the extent of this influence remains limited, particularly among first-year medical students who are still adapting to self-directed learning strategies. A quantitative approach with a correlational design was employed to address this issue. The study applied a cross-sectional method involving 50 first-year medical students as the research sample. Data were collected from students' scores in PBL tutorial discussions and CBT block examinations. Statistical analysis was conducted using One-way ANOVA to determine the relationship between the two sets of scores. The results revealed a positive and moderately strong correlation between tutorial scores and CBT performance in Block 1.1 and Block 1.3, with correlation coefficients of $r = 0.523$ and $r = 0.559$, respectively. These findings suggest that active participation in PBL sessions positively influences exam outcomes in certain learning blocks. In contrast, no significant relationship was observed between tutorial scores and CBT performance in Block 1.2 ($P > 0.05$), indicating variability in the impact of PBL across different subjects. In conclusion, student activity in PBL tutorials plays an important role in enhancing learning outcomes, though its influence may vary depending on the content and context of the learning block.

Keywords : CBT, medical student, problem based learning, tutorial discussion

INTRODUCTION

The Problem-Based Learning (PBL) approach was widely adopted in medical education to enhance student engagement and facilitate deeper learning. However, an important question arose regarding the extent to which student activity in PBL discussions affected exam outcomes, particularly in the context of Computer-Based Testing (CBT) (Hodges et al., 2024) (Shin & Kim, 2013). Research by Hassan et al. (2020) indicated a positive relationship between active participation in PBL discussions and academic achievement, while another study by Wuh et al. (2020) emphasized that factors such as intrinsic motivation also played a significant role, creating complexity in this relationship (Hussin et al., 2018; Wu et al., 2020). The mixed evidence from previous studies suggests that while active involvement in PBL tutorials can contribute to improved examination performance, the influence of other mediating factors such as tutor effectiveness, case design, and assessment alignment should also be considered to provide a more comprehensive understanding of this educational approach (Addae et al., 2017).

A study by (Kasarla et al., 2023) revealed that higher interaction levels in the learning environment positively impacted academic outcomes, suggesting that activity in PBL discussions could be key to achieving better exam results. Therefore, this research aimed to provide a deeper understanding of the impact of student activity in PBL discussions on CBT exam outcomes. The findings of this study were expected to contribute to the development of more effective learning strategies. Although many studies addressed the relationship between PBL and academic performance, there remained controversy regarding the specific role of student activity in discussions. For instance, research by (Zhang & Ma, 2023) showed that not all forms of activity positively contributed to exam results, highlighting the importance of the quality of interactions in discussions. This underscored the need for further studies to identify factors that might influence this relationship and explore new perspectives that may not have been previously examined (Romancenco et al., 2024).

Therefore, the objective of this study was to analyze the impact of student activity in PBL discussions on CBT exam outcomes among first-year medical students. The literature by Sullivan (2024) explained that first-year students underwent an adaptation process in various aspects that influenced academic performance (O' Sullivan et al., 2024). Given the ongoing controversy surrounding study results and the lack of research focusing on first-year students, this group was selected for investigation (Shimizu et al., 2019). The adaptation from secondary education to higher education in the medical program presented a novel aspect of this research, which was expected to provide new and practical insights for improving the learning process in medical education. This study was conducted to investigate the relationship between student engagement in Problem-Based Learning (PBL) tutorial discussions and their academic achievement as measured by Computer-Based Testing (CBT) in the form of Multiple Choice Questions (MCQ).

METHOD

This study employed a quantitative analytic design with a cross-sectional approach to examine the relationship between students' participation in Problem-Based Learning (PBL) tutorials and their performance in the Computer Based Test (CBT). The research population consisted of all first-year medical students at the Faculty of Medicine, Universitas Negeri Padang (FK UNP). A total of 50 students were included as the sample using a total sampling technique, considering the cohort nature of the first intake of students in the newly established faculty. The study was conducted at FK UNP during the first semester of the academic year, coinciding with the availability of PBL tutorial and CBT exam data. The instruments used in this research included the PBL tutorial discussion evaluation sheet, which assessed students'

participation scores during discussions, and the CBT exam evaluation sheet, which measured students' academic achievement through Multiple Choice Question (MCQ)-based assessments. Data analysis was carried out using descriptive statistics, such as frequency, percentage, mean, standard deviation, median, and interquartile range, while hypothesis testing was conducted using One-Way ANOVA with a significance level set at $p < 0.05$. The analysis was performed with the aid of SPSS software. Prior to data collection, the study obtained ethical approval to ensure compliance with research ethics standards. All participants provided written informed consent, confidentiality was maintained, and no personal identifiers such as names or student identification numbers were included in the dataset.

RESULT

The findings of this study suggest that there is a positive correlation between the tutorial discussion scores and CBT scores, specifically for Blocks 1.1 and 1.3. The correlation coefficients for these blocks were moderate, with $r = 0.523$ for Block 1.1 and $r = 0.559$ for Block 1.3. This indicates that students who performed well in the PBL tutorial discussions in these blocks also tended to achieve better results in the corresponding CBT exams. However, no significant correlation was found between the tutorial discussion scores and CBT scores for Block 1.2, as evidenced by a p-value greater than 0.05. This lack of correlation could suggest that the PBL tutorials in this block may not have been as effectively linked to the exam content or format. These results are consistent with previous studies that have demonstrated the positive impact of active participation in PBL tutorials on academic performance. For example, research by Smith et al. (2019) found that students who actively participated in PBL tutorials tended to perform better in exams. Similarly, Johnson and Lee (2017) reported a positive relationship between tutorial engagement and academic achievement in medical education. However, the lack of correlation for Block 1.2 adds an interesting dimension to the findings. It is possible that the specific nature of the content or the tutorial approach in Block 1.2 was less conducive to improving exam performance, which warrants further investigation.

The implications of these findings for practice and policy suggest that the structure and effectiveness of PBL tutorials could be improved to enhance student learning outcomes. The positive correlation observed for Blocks 1.1 and 1.3 indicates that more interactive and engaging tutorial methods may be beneficial, especially for complex topics. It may be helpful for educators to refine the PBL approach, ensuring that tutorials are tailored to support the understanding of challenging material. Educational policies might also consider encouraging such interactive teaching methods to foster better academic performance. Additionally, continuous assessment and feedback within the PBL framework could be emphasized to support students' learning and retention of the material, as the study indicates that this engagement might enhance exam results.

While the study has several strengths, such as using objective measures of academic performance and a cohort from a newly established medical program, it also has limitations. The lack of correlation for Block 1.2 may suggest that factors specific to that block—such as the content or teaching strategies—were not effectively translating into exam performance. The cross-sectional nature of the study is another limitation, as it prevents the exploration of long-term effects or changes in student performance over time. Moreover, the relatively small sample size of 50 students may not fully capture the variability in performance or provide sufficient power to detect smaller effects. Future research could build on these findings by exploring the underlying reasons for the lack of correlation between the tutorial scores and CBT scores for Block 1.2. Investigating the specific challenges faced by students in this block—whether related to the content, teaching methods, or other factors—could provide valuable insights for improving the PBL experience. Additionally, a longitudinal study design

could provide a more comprehensive understanding of how participation in PBL tutorials influences academic performance over time. Expanding the research to include other factors, such as student engagement, study habits, and faculty support, would also help to clarify the broader factors that contribute to the relationship between PBL participation and exam performance. The results the tutorial scores with the CBT scores from Block 1.1- 1.3 (table 1).

Table 1. Results The Tutorial Scores and The CBT Scores

Component	Tutorial Discussion	CBT
Block 1.1	86(80-92)	73(40-88)
Block 1.2	91(82-100)	63(36-87)
Block 1.3	92(83-98)	62(0-81)

Correlation Test of Tutorial Scores and CBT Scores (table 2 and figures 1-3).

Table 2. Correlation Test of Tutorial Scores and CBT Scores

Component		Pearson Correlation	Sig.(2- tailed)
Tutorial 1.1	CBT 1.1	0.523	<0.001
Tutorial 1.2	CBT 1.2	0.228	0.112
Tutorial 1.3	CBT 1.3	0.559	<0.001

Table 2 showed a positive correlation and a moderate strength of correlation between the tutorial scores for Blocks 1.1 and 1.3 and the CBT scores for Blocks 1.1 and 1.3 among the respondents, specifically $r = 0.523$ and $r = 0.559$, respectively. However, there was no correlation between the tutorial scores for Block 1.2 and the CBT scores for Block 1.2 among the respondents ($P > 0.05$).

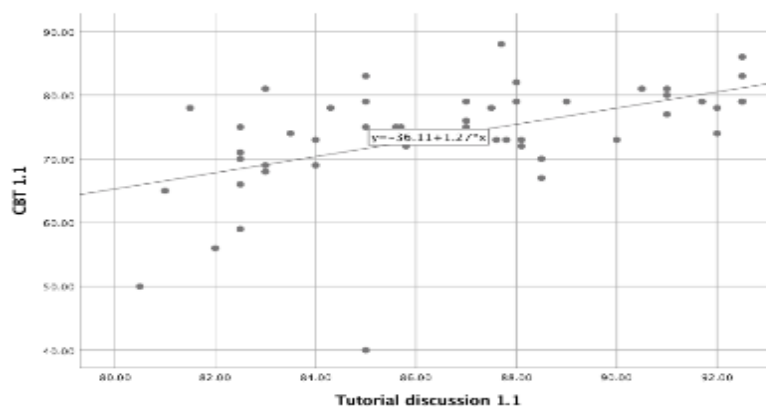


Figure 1. Correlation between Tutorial Scores and CBT Scores in Block 1.1

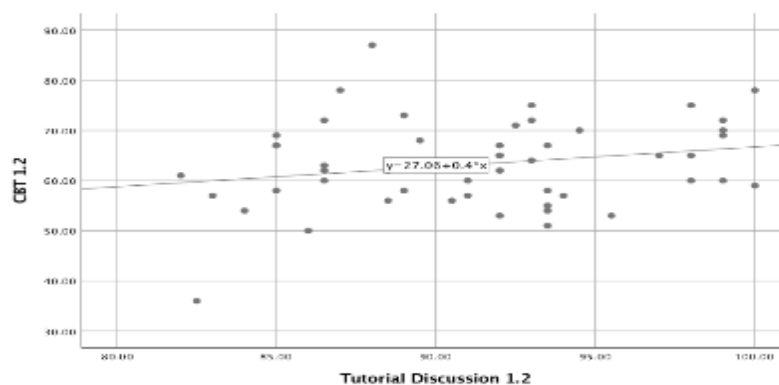


Figure 2. Correlation between Tutorial Scores and CBT Scores in Block 1.2

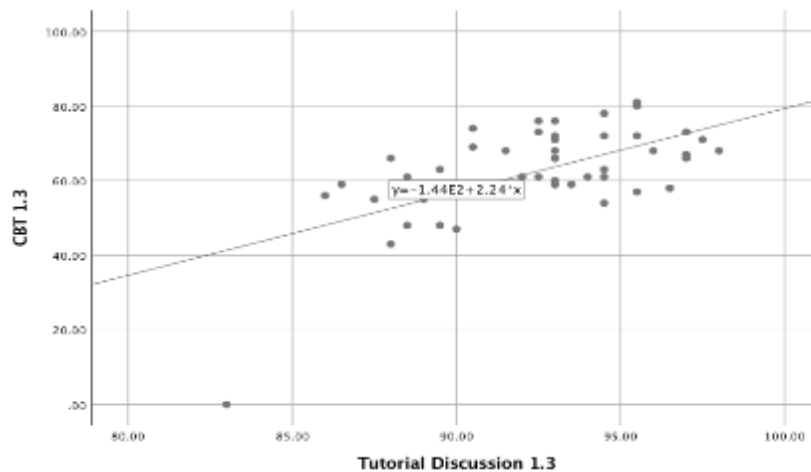


Figure 3. Correlation between Tutorial Scores and CBT Scores in Block 1.3

DISCUSSION

The main findings showed that student participation in PBL discussions had a positive and moderate correlation with CBT performance in Block 1.1 and Block 1.3, whereas Block 1.2 revealed no significant relationship. Conceptually, these findings align with activation elaboration theory and situational interest in PBL, which emphasize mental model construction relevant to problem-solving, thereby facilitating retrieval during examinations. (Schmidt et al., 2011). Systematic reviews and meta-analyses confirm that PBL improves long-term retention, skill development, and student satisfaction, although the effects on short-term test performance depend on the alignment between assessment and PBL objectives (Strobel & van Barneveld, 2009). This helps explain why stronger correlations appeared in some blocks but not in others. Another meta-analysis highlights that PBL's effectiveness depends on whether assessments target conceptual understanding and application underscoring the importance of exam blueprinting and case alignment (Yew et al., 2011).

The variability across blocks may also stem from process-related factors. PBL learning is cumulative across phases (problem trigger, discussion, self-directed study), meaning that weaknesses in any stage can undermine outcomes. This may have contributed to the weaker association in Block 1.2 (Yun et al., 2023). Tutor performance and case design (e.g., quality of facilitation, relevance of triggers, and emotional cognitive engagement) also play important roles in shaping participation and outcomes. Recent evidence further demonstrates that student engagement profiles correlate with achievement: constructive participation is linked to higher success rates, whereas passive behavior correlates with increased failure (Manuaba et al., 2022). Nonetheless, some studies in early medical training report inconsistent effects of PBL on critical thinking and knowledge compared to traditional methods again highlighting the influence of context, design, and assessment.

In assessment terms, the nature of CBT/MCQ items (e.g., adaptability, efficiency, reliability) may influence their sensitivity to PBL outcomes. When questions assess application and clinical reasoning, the relationship with PBL engagement tends to be stronger; when dominated by factual recall, the relationship may weaken (Van Wijk et al., 2024). Studies on related methods such as case-based learning (CBL) and team-based learning (TBL) suggest that time spent is less predictive than the quality of participation (e.g., IRAT scores, student-generated MCQs)—implying that “activity” should be defined in terms of value-added engagement rather than duration alone (Tuin et al., 2024). Overall, this study aligns with evidence that PBL enhances clinical reasoning and exam performance when well-integrated, while also confirming that effects are not uniform across topics or blocks. Other moderating

factors may include tutorial delivery mode (online vs. offline), exam format preferences, and the readiness of first year students.

CONCLUSION

This study found that the level of student activity in Problem-Based Learning (PBL) tutorial discussions influenced the results of the Multiple Choice Questions (MCQ) in the Computer-Based Testing (CBT) among first-year medical students.

ACKNOWLEDGEMENT

We would like to express our deepest gratitude to all parties who have contributed to this research. Our thanks go to our colleagues who have provided valuable suggestions, support, and inspiration throughout the research process. We also wish to thank everyone who took the time to participate in this study. Furthermore, we extend our appreciation to the institutions that have offered their support and facilities in carrying out this research. Every contribution and assistance has been greatly meaningful to the smooth execution and success of this study. Thank you for all the hard work and collaboration that has been established.

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