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Assessing the Impact of Peer-Led Learning on Medical Student Performance: A Randomized Study

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Abstract

Peer-led learning (PLL) has gained prominence as an effective pedagogical strategy in medical education, yet its impact on academic performance remains debated. This study aims to evaluate the effectiveness of PLL in improving medical students' knowledge acquisition and problem-solving skills compared to traditional faculty-led instruction. A randomized controlled trial was conducted with 200 third-year medical students, divided into an intervention group (PLL, n=100) and a control group (traditional faculty-led instruction, n=100). Pre- and post-intervention assessments were performed, and performance differences were analyzed using independent t-tests and ANOVA. Results demonstrated a statistically significant improvement in post-test scores in the PLL group (mean=82.5, SD=5.2) compared to the control group (mean=75.3, SD=6.1) ($p<0.001$). Additionally, students in the PLL group reported higher engagement and confidence in clinical decision-making. The findings suggest that PLL enhances medical student performance and engagement, advocating for its integration into medical curricula. These results contribute novel insights into medical education, supporting the shift toward collaborative learning environments.

Keywords: Peer-led learning, medical education, student performance

Introduction: Medical education continuously evolves to incorporate innovative learning methodologies that enhance student comprehension, critical thinking, and clinical decision-making skills. Traditional faculty-led instruction has long been the cornerstone of medical training, providing structured knowledge dissemination. However, recent pedagogical advancements emphasize the importance of active and collaborative learning approaches (Mullins et al., 2022). Peer-led learning (PLL) has emerged as an alternative educational strategy, wherein students assume teaching roles to facilitate knowledge exchange within their peer groups. This model fosters deeper understanding through active engagement, discussion, and reciprocal teaching (Alamri et al., 2023).

Several studies have explored the effectiveness of PLL in various educational settings, particularly in medical education, where the complexity of learning requires adaptive teaching methodologies (Smith et al., 2021). It has been suggested that students learn more effectively when taught by peers, as the relatability factor enhances engagement and fosters a more interactive learning environment (Nguyen et al., 2023). Despite these advantages, concerns persist regarding the reliability of peer instruction, given that students may lack the expertise and pedagogical training required for effective knowledge transmission.

Empirical evidence on PLL's impact on academic performance remains inconclusive, necessitating further research to establish its efficacy. Some studies indicate significant improvements in knowledge retention and self-confidence among students engaged in PLL (Gupta et al., 2023). Others argue that while PLL enhances conceptual understanding, its effectiveness in comparison to traditional faculty-led instruction varies depending on course content and student preparedness (Lee et al., 2022). Given these discrepancies, this study aims to provide a robust evaluation of PLL's impact on medical students' academic performance using a randomized controlled design.

This research is particularly relevant in the context of modern medical curricula, where active learning strategies are increasingly emphasized. Medical education reform initiatives advocate for interactive and student-centered approaches, underscoring the importance of empirical evidence to support such pedagogical shifts (Rodriguez et al., 2024). This study contributes to the ongoing discourse by assessing the effectiveness of PLL in comparison to traditional teaching, addressing gaps in existing literature, and providing statistical validation of its impact on student performance.

By systematically comparing student outcomes in peer-led and faculty-led instructional settings, this research aims to provide insights that can guide curriculum development and optimize learning strategies in medical education. The findings hold implications for educators, policymakers, and academic institutions seeking to implement evidence-based teaching methodologies that enhance student engagement, knowledge retention, and problem-solving abilities.

Methodology

A randomized controlled trial was conducted to assess the impact of PLL on medical student performance. The study enrolled 200 third-year medical students at Shalamar Institute of Health Sciences, Lahore randomly assigned to either the PLL group (n=100) or the faculty-led instruction group (n=100) using an online randomization tool. Sample size calculation was performed using Epi Info software, with an expected effect size of 0.5, power of 80%, and $\alpha=0.05$, yielding a minimum required sample of 98 per group.

Students in the PLL group participated in structured peer-led sessions, where designated student instructors guided discussions and problem-solving activities. The control group received traditional lectures by faculty members. Pre- and post-intervention assessments were administered, consisting of multiple-choice questions and case-based scenarios. The primary outcome measure was the difference in mean post-test scores between the groups, analyzed using independent t-tests and ANOVA. Secondary outcomes included student engagement levels, measured through validated survey instruments.

Inclusion criteria comprised enrollment in the third-year medical curriculum and informed verbal consent. Exclusion criteria included prior participation in peer-led programs or failure to attend $\geq 20\%$ of sessions. Ethical approval was obtained from the institutional review board. Data confidentiality and anonymity were maintained throughout the study.

Results

Table 1: Demographic Characteristics of Participants

Characteristic	Peer-Led Learning (n=100)	Faculty-Led Instruction (n=100)	p-value
Age (years, mean±SD)	22.3 ± 1.1	22.5 ± 1.0	0.34
Gender (M/F)	48/52	50/50	0.72
Prior Peer Learning Experience (%)	12%	14%	0.65

No significant differences in baseline characteristics were observed, ensuring comparability between groups.

Table 2: Academic Performance Outcomes

Measure	Peer-Led Learning (n=100)	Faculty-Led Instruction (n=100)	p-value
Pre-test Score (mean±SD)	68.4 ± 4.8	68.2 ± 5.0	0.81
Post-test Score (mean±SD)	82.5 ± 5.2	75.3 ± 6.1	<0.001
Score Improvement (%)	20.7%	10.4%	<0.001

The PLL group demonstrated significantly higher post-test scores and greater performance improvement.

Table 3: Student Engagement and Confidence

Factor	Peer-Led Learning	Faculty-Led Instruction	p-value
Engagement Score (1-10)	8.7 ± 1.1	6.5 ± 1.3	<0.001
Confidence in Clinical Decision-Making (%)	78%	54%	0.002

Students in the PLL group reported significantly higher engagement and confidence in clinical decision-making.

Discussion

The findings of this study substantiate the efficacy of PLL in medical education, demonstrating statistically significant improvements in academic performance and engagement. The 9.6% higher mean post-test score in the PLL group underscores the advantage of student-driven learning approaches in knowledge acquisition (Chen et al., 2023). The significant improvement in engagement and confidence aligns with prior research advocating for interactive pedagogies in medical training.

Critically, these results validate the role of PLL as a complementary instructional strategy rather than a replacement for faculty-led teaching (Anderson et al., 2023). While some concerns persist regarding student-led instruction quality, structured peer mentorship mitigates this limitation by fostering cooperative learning environments (Liu et al., 2024). Future studies should explore longitudinal effects and adaptability across different medical disciplines.

Conclusion

This study provides compelling evidence supporting PLL as an effective pedagogical tool in medical education. The findings highlight significant improvements in academic performance, engagement, and confidence. The integration of PLL into curricula may enhance student-centered learning strategies, addressing educational gaps in traditional instruction.

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