

ORIGINAL RESEARCH

Pathology Pedagogy: Students Reflect on Peer Teaching and Learning Experiences

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ABSTRACT

Introduction: Peer-assisted teaching and learning (PTL) is a learner-centered approach increasingly adopted in medical universities globally, employing active learning strategies to engage students. This study explores student perceptions of PTL in the context of group-led seminars, fishbowls, and interactive classroom activities, with a focus on conceptual topics related to various types of anemia. **Objective:** The primary objectives of this study were to investigate student perceptions of PTL methods, specifically group-led seminars, fishbowls, and interactive activities, and to compare their acceptability and efficacy in understanding various types of anemia. **Methods:** Second-year medical students participated in ten consecutive PTL sessions, incorporating group-led modified seminars, fishbowls, and interactive activities like street plays, prop sessions, and quiz sessions. The aim was to enhance their comprehension of the clinical features and etio-pathogenesis of different types of anemia. Focus group discussions involving 14 students and one facilitator each were conducted to delve into the factors influencing learning. Qualitative thematic analysis was performed on audio recording transcripts by the authors. **Results:** The thematic analysis revealed several key aspects that influenced the effectiveness of PTL. These aspects fell under the categories of teacher, student, and organization. Noteworthy findings included the significance of peer teacher motivation, student interest and collaboration, contact time between students and facilitators, preparation time, alignment with other curricular activities, group size and composition, topic suitability for specific activities, and the availability of preparatory materials. These sub-aspects played pivotal roles in shaping the learning experience. **Conclusion:** The study underscores the importance of various factors in the success of PTL. Effective PTL requires the dedicated involvement of peer teachers, student receptiveness, and sufficient contact time. Adequate preparation, alignment with the curriculum, and course coherence are prerequisites for optimal PTL outcomes. This research offers valuable insights into the dynamics of PTL in medical education, highlighting the need for careful planning and consideration of these factors to enhance the learning experience.

Keywords: Aspects, interactive, peer-led seminars, peer teaching and learning, qualitative study, small group

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INTRODUCTION

In medical universities worldwide, a paradigm shift is occurring, transitioning from traditional, individual learning to a learner-centered approach where students take on the responsibility of identifying their learning gaps and deficits [1, 2]. Peer-assisted teaching and learning (PTL) stands as a prime example of this method, emphasizing active student involvement in the educational process. Classroom-based PTL manifests through formats such as seminars, fishbowls, and interactive activities. In seminars, students take the role of educators, teaching their peers within the classroom setting. For small group activities, students are organized into groups of fewer than eight individuals to tackle assigned tasks. The fishbowl technique involves a small group discussing a topic while being observed by a larger audience

[3][4]. Group tasks may culminate in a plenary session where a facilitator summarizes the key points discussed during the group activities.

This approach encourages active student participation, promoting the development of teaching, coordination, and management skills [5][6]. Effective PTL relies on the provision of constructive feedback from peers, fostering a culture of teamwork, encouraging cooperative learning, and increasing student motivation [7].

Anemia, being a conceptual topic, presents unique challenges, as different types of anemia exhibit varying etio-pathogenesis, clinical presentations, investigative methods, and treatment approaches. Comprehending such complex concepts in the field of pathology at the undergraduate level necessitates

substantial effort and commitment from both students and educators.

This study was designed to compare and evaluate student acceptance and effectiveness of PTL methods, specifically group-led seminars and fishbowl discussions facilitated by interactive activities within the classroom environment. Additionally, it aimed to investigate the factors influencing the quality of PTL when implemented in a classroom setting.

METHODS

This pilot interventional study was carried out with second-year M.B.B.S. undergraduates at a reputable Western Indian Medical College, known for its commitment to research and student welfare. Despite this dedication, traditional didactic lectures remained the primary teaching method in many subjects at the institution. Interactive teaching and learning (TL) accounted for only 5-10% of the curriculum. Therefore, the study was conceived to promote PTL as a powerful educational tool.

After obtaining informed consent and informing students of the study's details, 250 second-year M.B.B.S. students were enrolled in PTL activities scheduled during regular college hours over four weeks. The study received approvals from the research committee and ethics committee.

The students were divided into ten small groups, each consisting of 25 students. In the introductory session, different student groups were assigned diverse activities related to different types of anemia. Each activity varied in formality level and the method of performance (as detailed in Table 1). Peer-teacher groups were tasked with preparing their activities and subsequently presenting them during peer teaching sessions within the classroom. The peer-teachers were expected to learn by teaching, while peer-learners were expected to learn by observing. The scheduling of classroom activities allowed ample time for preparations.

Table 1. Various activities allotted to the individual student groups for discussing different type of anemia

Activity number	Activity title	Method of performance by peer teacher group	Motive
1	Clinical presentation of anemia	Street play	To understand symptoms and elicit signs of general presentation of anemia
2	Mechanism of iron absorption and assimilation	Prop activity using colored chalks as iron atoms, dusters as transferrin, benches as duodenal epithelial cell, individual students with affixed charts on their clothes as RBC precursors, class corridors as bone marrow	To understand role of haem and nonhaem iron, enterocyte, transferrin, ferritin, sideroblasts, hemosiderin in iron absorption and assimilation
3	Case-based discussion on iron deficiency anemia	Clinical case with investigation reports and clinical images	Understand when to order laboratory investigations and how to interpret them
4	Case-based discussion on anemia of chronic disorder	Clinical case discussion with investigation reports and clinical images	Differentiate different microcytic hypochromic anemia through laboratory investigations
5	Pathogenesis of megaloblastic anemia	Fishbowl on pathogenesis assisted by flowcharts and pictures	Allow students to use their creativity to make flowcharts to understand role of intrinsic factor in vitamin B12 absorption and utilization
6	Peripheral blood and bone marrow picture of megaloblastic anemia	PowerPoint seminar on hematology slide demonstration	Interpret and explain bone marrow architecture, different type of cells, and their different morphology in megaloblastic anemia
7	Overall clinical features of hemolytic anemia	Video-assisted PowerPoint seminar by peer-teachers	To make a provisional diagnosis of different hemolytic anemia by different clinical presentations
8	Etio-pathogenesis and clinical features of and a thalassemia	Blackboard teaching session	Compare the previous methods of learning with

			learning using the blackboard teaching
9	Etio-pathogenesis, clinical features, investigation and treatment of sickle cell anemia	MCQ session	Remember the various clinical presentations of sickle cell anemia by preparing MCQ by peer group and answering the doubts of rest of the class regarding the answers to them
10	Etio-pathogenesis and clinical features of immune hemolytic anemia and G6PD deficiency	Quiz session by peer teachers	

The students assumed distinct roles in planning, preparing, and executing the peer activities. Roles included group leader, script writer, and director in activities such as plays and props. In activities involving multiple-choice questionnaires (MCQs) and quizzes, the peer group distributed the work of designing questions amongst themselves. Students with strong presentation skills acted as quiz masters. While most activities allowed adequate preparation time, the prop activity required peer-teachers to read in advance, and materials like chalk, dusters, stoles, benches, and small cardboard boxes were provided at the start of the classroom session. Students were given 15 minutes to prepare and present their activities to their peers. This approach necessitated on-site coordination and group dynamics. To prevent monotony and maintain student interest, different methods or activities were employed during the ten sessions.

Twenty second and third year pathology residents served as facilitators for two groups each and assisted students in activity preparation. For most activities, except those performed extemporaneously, the content and extent of participation were reviewed by facilitators before the activities took place. Facilitators either attended the final rehearsal or requested

students to present their materials, notes, and presentations before the session. To explore student perspectives on the factors influencing PTL in these activities, focus group sessions were held in five groups of 50 students each. Facilitators posed semi-structured and open-ended questions, and to avoid bias, they switched groups during the questioning. Due to time constraints, one facilitator interviewed two groups simultaneously. The discussions were audio-recorded, and essential points were summarized for validation by the participating students.

The audio recordings were transcribed, and the transcripts are shown in Table 2a. Content analysis, as described by Krippendorff, was employed to derive valid inferences from the data to its context [8, 9]. A coding system was developed for content analysis. Both authors independently read all transcripts, making notes of their initial impressions regarding each relevant student quote. These impressions were then transformed into codes, and labels were used to establish an initial coding scheme. Any disparities in the coding schemes were resolved through discussion between the authors. The codes were then consolidated into emerging themes, and qualitative thematic analysis was conducted on these themes and aspects. The method for transcript analysis is presented in Table 2b.

Table 2a: Important highlights of transcript of the recordings

Seminar teacher and facilitator	<p>The best thing about peer learning is that peer-teacher tried to involve all the students to participate. Thus, all sessions were interactive except a few</p> <p>The teacher should be able to guide the creativity of the student. Exercises such as street play and prop activity to explain the clinical features and pathophysiology of anemia gave us that opportunity</p>
Peer-teacher	<p>Peer-teacher teaching through PowerPoint should describe each point on the screen. Peer-teacher must be able to explain even the wrong options in an MCQ.</p> <p>Peer-teacher taking the seminar just for sake of it and not taking his responsibility takes away interest of students</p> <p>Teacher should control the group activity and lead the session in a desired direction and should elicit answers of seminar questions from learners rather than answering themselves</p>
Student characteristics	<p>The different peer-teaching seminars not only boost our confidence in teaching but also helped us get rid of stage fear, stimulated our creativity, coordination, and team spirit</p>
Type of activity	<p>Using a chalk, duster, bench, or individual as a prop is a new way to see it as a study tool and make education and teaching out of that</p> <p>It was very interesting to see a play that gives knowledge regarding the subject</p> <p>PowerPoint presentation gives precise and all-important information through pictures and videos and even soft copies of presentations can be given as notes</p> <p>MCQ seminars help in thorough preparation of topic for presenters as well as peer learners</p> <p>Blackboard teaching required extra effort from my side for making notes and remembering everything before teaching in class</p> <p>Conducting, preparing, and answering in quiz requires greater team work and participation and entire class is involved in a competitive mode</p>
Discouraging quotes regarding type of activity	<p>Presenting symptoms and signs through a play, takes away focus from the main topic</p> <p>Idea of using a prop is not only difficult but also useless</p> <p>PowerPoint seminars should be omitted from peer teaching as they are same as didactic lectures</p> <p>CBL can be omitted. When we have a big hospital attached with medical college and so many classical cases in wards, why simulate!!</p> <p>Quiz is not an ideal way of student assessment as only the quick ones use their mind.</p>
Seminar planning and execution methodology	<p>It is always better to distribute topics in the starting of module to respective students</p> <p>Participation must not be forceful but voluntary</p>
Suitability of topic for the type of activity	<p>It was fun to learn anemia the way it was being discussed in different sessions, especially the play activity which made me understand the clinical features, prop activity for understanding pathogenesis and plenary session after every seminar to understand the clinical point of view</p>
Group functioning	<p>Strict warning should be given that this group has to present assigned exercise on allotted date and scoring of activities should be added to internal assessment</p> <p>In quiz all the students study as anyone can be asked a question and there is a good discussion</p> <p>In play its fun as roles given to students are subsequent and all the participants have dialogues</p> <p>PowerPoint or blackboard teaching seminars get little monotonous if only the peer-teacher is speaking and there is only one-way flow of information</p>
Preparation related aspects	<p>Students need ample amount of time to study, prepare, and bring out the innovative ideas for their performance</p> <p>The allotted tasks should be taken seriously by all the participants and they should rehearse properly so that entire group can perform in the expected manner. Defaulters better are chucked out even if it reduces the group size</p>
Schedule and seminar timing	<p>A peer learning activity should always be scheduled in morning hours when we are more receptive to incoming knowledge</p> <p>An interesting play session can be kept after a boring didactic lecture of other subject</p> <p>The peer activity should not consume much time, and everything should happen in a planned way. The lecture before MCQ session was too long and less time was left for MCQ discussion</p>

Table 2b: Examples of transcript analysis

<i>Quote</i>	<i>Code</i>	<i>Coding category</i>	<i>Aspect</i>
"The teacher should be able to guide the creativity of the student"	Ability of teacher to stimulate creative thinking in students	Skills of teacher	Seminar teacher
"Using an object as prop is a new way to see it as a study tool and make education and teaching out of that"	Utility of props to enhance medical learning	Type of activity	Activity characteristics and dynamics

RESULTS

The participant comments were systematically categorized into three fundamental themes, and within these, seven major aspects and numerous sub-aspects were identified, ultimately forming a comprehensive framework [Table 3]. The student perspectives and their analysis are detailed below.

Table 3: Aspects and Sub-Aspects Affecting Learning in Peer-Led Seminars and Interactive Activities Emerging from Focus Group Discussions

<i>Themes</i>	<i>Key aspects</i>	<i>Sub aspects</i>
Teacher	Seminar teacher characteristics	Goal directed teaching Involvement of teacher himself in small group activities Motivation to teach Experience in conducting and facilitating large group and small group activities
	Peer teacher characteristics	Motivated to teach Interest in teaching Ownership of seminar Communication skills Knowledge of subject and topic
Student	Student characteristics	Distinct roles in planning, execution and group dynamics Motivation to learn Active participation Collaboration and interpersonal communication Creativity Student behavior and personality Time management skills
	Preparation related aspects	Preparation time Student motivation and interest Other curricular and extracurricular activities Preparation materials and facilities like internet and library Expectations of other learners Expectations of seminar facilitator Help from college administration Acknowledgement of student effort by facilitator, teacher and administration Fear of consequences of not preparing
Student cont...	Group functioning	Group size Group composition Type of activity and amount of interaction Distribution of tasks and responsibility Reward or Punishment
Organization	Seminar methodology	Time management Proper distribution of tasks between peer teachers, seminar facilitator and seminar teacher Random allotment of activity Timely allotment Importance of plenary session after peer teaching task
	Seminar schedule	Seminar schedule and timing Sequence of seminars and other educational activities Coherence with other subject teaching schedule Contact timing for the complete education program Contact time between students and with facilitator
	Activity characteristics and dynamics	Type of activity Timing of activity Suitability of topic for the kind of activity Usefulness and role of activity in learning Availability of material for particular activity Availability of guidance Student creativity and expertise

Peer-Teacher and Performer Group Characteristics

Students expressed a strong preference for peer-teacher groups that were effective in fostering learner involvement, participation, and active thinking, regardless of the specific activity assigned to them. The ability of peer-teachers to take ownership and responsibility for their assigned tasks garnered significant appreciation. Even in activities with a low formality level, students recommended that peer-teachers maintain control over the classroom dynamics and the activity. They particularly favored

teachers who could elicit responses from the audience during plenary sessions. Conversely, students did not respond favorably to peer-teachers who struggled to strike the right level of formality in their sessions.

STUDENT CHARACTERISTICS

Students found value in participating both as performers and learners in PTL seminars. They appreciated their roles as active participants, group coordinators, planners, actors, scriptwriters for plays

or prop sessions, prop designers for explaining pathogenesis, quiz masters, MCQ developers, and, most importantly, as peer teachers for their fellow students. They had high expectations for themselves and their colleagues, expecting teamwork, the integration of knowledge with assigned tasks, the creation of comprehensive seminar notes, the formulation of high-quality MCQ and quiz questions, and ultimately, effective peer teaching. Students also played the role of constructive critics, engaging in healthy discussions during case-based studies. The level of student motivation fluctuated depending on various factors, including the type of activity, the topic at hand, the timing of the seminar, the allotted preparation time, and the number of group members present during the activity.

TYPE OF ACTIVITY

Students expressed a clear preference for activities that promoted student interaction, interpersonal communication, creativity, and public speaking, facilitating the overcoming of hesitations. These activities included plays, props, quizzes, and class discussions. Students were enthusiastic about using everyday items such as chalk, dusters, benches, dustbins, and stoles as props and study aids, enhancing their understanding of iron deficiency anemia's pathology. MCQ seminars and quizzes were highly regarded for deepening comprehension of various types of hemolytic anemia, with presenters benefiting from the effort invested in preparation. These activities put the entire class in a competitive mode, contributing to better retention of the topic. While blackboard seminars required additional effort for both remembering and preparing notes before the peer-teacher group's presentation, many students preferred them due to natural pauses during the presentation, which allowed them to take notes and easily follow the lecture content. Others favored PowerPoint seminars for their audio-visual effects, images, and the convenience of accessing the PowerPoint slides as class notes.

A few students discouraged the use of plays, suggesting that they diverted attention from the main topic. Some found the use of props to be challenging and of little utility. While quizzes were considered helpful for those who could quickly engage their minds and respond, others preferred real patient case discussions in clinical wards to simulating scenarios in classrooms.

Seminar Planning and Execution Methodology

Students recommended reducing group size to less than four students, as they believed this would foster healthier group interaction. They emphasized the importance of allocating sufficient time for activity preparation and advocated for distributing tasks equally among group members to ensure shared responsibility and prevent overburdening of a few individuals. Students also suggested incorporating a small MCQ session before each subsequent day's

seminar to review concepts from the previous day. Additionally, they requested that plenary sessions following PTL activities be concise but adequate for highlighting the essential points discussed during that session. However, it was acknowledged that providing enough time for seminar preparation, in-class MCQ sessions, and plenary sessions after each activity was challenging to manage within the allotted time frame.

Suitability of Topic for the Type of Activity

Students appreciated the assignment of specific interactive activities for understanding different topics. For instance, they found that play activities were effective for comprehending patient presentation, examination techniques, and signs elicitation, while prop activities were ideal for grasping pathophysiology. Quiz sessions were instrumental in understanding the intricacies and differences among various types of hemolytic anemia. Quiz and MCQ sessions encouraged students to read and study independently, which further facilitated comprehension during classroom question-and-answer sessions.

Group Functioning

Students observed that groups functioned optimally when there were strict deadlines and a sense of compulsion regarding time and attendance. Given the presence of low formality level activities, students believed that not all participants took their tasks seriously enough, prompting calls for warnings, punishments, or rewards to encourage timely task completion and ensure effective group functionality. Quiz sessions, in which all students shared equal responsibility, were particularly appreciated.

"In a quiz, all the students study as anyone can be asked a question, and there is a good discussion. In a play, it's fun as roles assigned to students are sequential, and all participants have dialogues."

Preparation-Related Aspects

Preparation was considered the most critical parameter influencing the TL experience. According to students, the outcome was significantly affected by the time allocated for preparation, access to preparation materials, classrooms, and even internet facilities after college hours. Factors influencing student preparation included motivation, interest, fear of consequences of inadequate preparation, and the impact of curricular and extracurricular activities conducted in other departments. Students also expressed a need for well-structured preparatory materials and guidance from technical experts for creating PowerPoint presentations. They sought assistance from the college administration to fund the design of better props that could be used by future batches. Acknowledging students' efforts and including remarks in their Curriculum Vitae or recommendations from the principal or faculty were suggested as incentives to encourage better preparation.

Schedule and Seminar Timing

Students suggested that effective scheduling is crucial, particularly when an experimental module is ongoing in one subject. They proposed minimizing class tests and assessments in other subjects during this period, or standardizing the methodology across all subjects in the professional course. Proper sequencing of lectures and the timing of PTL activities were also emphasized. Students preferred PTL activities scheduled in the morning or after a monotonous didactic lecture from another subject. During peer presentations, it was crucial to allocate adequate time for discussions and explanations.

DISCUSSION

In this study, we sought to explore student perceptions of PTL in peer-led seminars, fishbowls, and interactive activities, and qualitatively analyze the emerging aspects. The major aspects revealed in our analysis encompassed seminar-teacher and peer-teacher characteristics, student characteristics, preparation-related factors, group functioning, seminar methodology, seminar scheduling, activity characteristics, and dynamics [Table 3].

Our findings align with previous studies on small group seminar learning, suggesting that the aspects influencing learning in PTL are analogous to those affecting traditional seminar learning [4, 10-14]. Similar to Sprujit et al., we found that factors influencing learning encompass student attributes, methodology, course schedule, group interaction and composition, intragroup interaction, and the alignment of educational methods [10-11]. Our study highlighted that students preferred peer-teachers who exhibited enthusiasm, creativity, and excellent interpersonal skills. The students highly valued peer-teachers who took ownership of their assigned tasks and activities. Some students emphasized the importance of maintaining a certain level of formality during the sessions, as low formality levels were observed in activities like street plays and prop presentations, which, according to student feedback, did not significantly affect learning. Coordinating and effectively communicating within a low formality level activity required significant effort on the part of facilitators, highlighting the need for facilitators to invest substantial effort in achieving the desired learning outcomes [3,11].

In our study, the performance of peer-teacher groups received the most enthusiastic response during MCQ sessions and quiz sessions. These activities facilitated audience involvement and group interaction while maintaining focus on the task at hand. A noteworthy aspect of our peer-led seminars and fishbowl discussions was the reduced resistance between peer-teacher and learner groups, all while maintaining the dynamics of the group. Other studies by Chou et al. and Menzes and Premnath also underscore the importance of a safer learning environment when learning from peers rather than experts, as the relative

absence of status and hierarchy reduces the pressure associated with practice and performance in front of others [15, 16].

The involvement of students in various activities was deemed effective in maintaining interest and avoiding monotony. However, the type of activity significantly influenced student engagement, as noted by Greenstock et al. [17]. Some students merely wanted to observe their peers perform without actively participating, which, in our view, required appropriate action or counseling. Addressing such students demanded substantial input and time from facilitators, who already had departmental and hospital duties. Edmund and Brown indicated that the effectiveness of small group learning depends on the skills and motivation of teachers, and they concluded that it is challenging to generalize the findings of small group learning studies, as controlling all variables in experimental studies is extremely difficult [4].

The concept of peer-led experiential learning aligns with sociocultural learning theory, which explains how participation and interaction with peers help students create knowledge, understand the task's requirements, and gain insights into their performance relative to the expected standard [18].

Various sub-aspects associated with students, such as the distinct roles they played during planning and execution, their behavior, motivation and involvement, creativity, interpersonal communication, interaction and coordination, and time management skills, significantly affected learning outcomes. Similar to Edmond and Brown, Dennick et al. emphasized students' motivation, thorough preparation, active participation, collaboration with other students, effective learning styles, and good time management as prerequisites for deeper learning [4, 11, 14]. Our study suggested that smaller groups of four or five students were preferable for better preparation, coordination, group stability, healthy group dynamics, and performance. Edmund and Brown also indicated that group sizes of 6–8 students were ideal for enhancing learning, fostering discussion skills, exploring attitudes, and sharing experiences [4]. Dividing students into smaller groups might have resulted in more individual activities and an increased total course and contact time per day or per week, potentially leading to monotony and requiring more time from facilitators and teachers.

We concur with the recommendation that plenary sessions following group activities should be brief, with a focus on the essential points discussed by the peer-teacher group, to avoid repetitive and monotonous discussions [4].

Limitations

This study was conducted with a limited number of participants, representing only one MBBS professional batch from a single medical college for a brief period. To fully assess the impact of PTL, a larger-scale study involving students from other batches, colleges, and universities is warranted.

Responses may not represent the opinions of all students, as not all students actively participated in focus group discussions, nor did they individually prepare and perform all the activities. Conducting individual interviews may have yielded more comprehensive responses, but this was not feasible due to time constraints. Furthermore, the comments provided are context-dependent, making it unclear to what extent the findings can be extrapolated to other settings.

FUTURE RESEARCH

The results from our study point to areas in need of further research on peer-teaching seminars, including seminar methodology, seminar scheduling, activity dynamics, course coherence, and the sequencing of different educational methods. We recommend additional research in these aspects to enhance learning outcomes in peer-led seminars and fishbowls.

CONCLUSION

The various aspects influencing peer TL in our study closely resemble those affecting traditional seminar learning. These include the involvement and ownership of peer-teachers, student receptiveness and motivation, adequate preparation time and contact time, appropriate group composition, effective group functioning and interaction, alignment of course activities, selection of suitable topics for each activity, sound seminar methodology, a schedule coherent with other curricular and cocurricular activities, and above all, the creation of a nonthreatening learning environment.

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