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Original Research Article

Effectiveness of Incorporating GBL (Game Based Learning) in TL (Traditional Lectures) For Phase 3 Part I MBBS Students in Paediatrics

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Abstract:

Background: Medical education is increasingly adopting student-centered approaches, with Game-Based Learning (GBL) emerging as a cutting-edge method to boost engagement, motivation, and knowledge retention. In the past, teaching and learning methods predominantly emphasized knowledge acquisition over immersive educational experiences. Today, there is a growing embrace of playful approaches, with game-based learning (GBL) seamlessly integrating engagement and education. We implemented game-based applications and traditional learning methods using multiple-choice questions (MCQs) to evaluate their effectiveness in creating an engaging and productive learning experience for medical students.

Methods: An interventional study was conducted among 60 Phase 3 Part 1 MBBS students at a Medical College and tertiary care Hospital in Eastern India. A crossover design was used, where two groups comprising 30 students in each group experienced both TL and GBL for different topics. Pre- and post-tests were conducted and student satisfaction was assessed using a Likert scale. Statistical analysis was done using paired, unpaired t-tests and the Wilcoxon Signed-Ranks Test, p value < 0.05 was considered significant.

Results: In our study, post-test scores showed significant improvement within both groups ($p < 0.05$). The GBL group demonstrated a greater increase in scores compared to the TL group, with a statistically significant difference ($p < 0.01$). Student satisfaction ratings were notably higher for GBL, indicating a strong preference for this approach ($p = 0.0001$).

Conclusion: GBL is an effective addition to traditional lectures, enhancing knowledge retention and learner satisfaction. While the study supports the use of GBL in medical education, larger studies are needed for broader validation.

Keywords: Game Based Learning, Traditional Learning, Medical Education.

Introduction

Education is an ever-evolving process that requires continuous refinement. Traditional teaching and learning practices have primarily relied on didactic lectures as the gold standard. The effectiveness of DL depends on the instructor, who imparts a significant amount of information with minimal student interaction and usually takes place in a classroom where the instructor is the focal point. From the traditional approach of teacher-centered instruction, we are transitioning towards a learner-centered teaching methodology. Teaching medical education using conventional methods can often become dull and one-sided. Medical educators face the challenge of discovering innovative methods to enhance the learning experience, making it more engaging, motivating, and enjoyable. In today's educational landscape, it is essential to offer students alternative approaches to traditional learning methods in the teaching-learning process.[1] With the rapid progress of technology and the far-reaching impact of medical information, students need to develop innovative skills through inter-professional learning to keep them motivated in their studies. One innovative method that can be used as a teaching and learning approach is game based learning. Game-based learning (GBL)is the practice of incorporating games into the teaching and learning process. It has been proven

to be highly effective in capturing and maintaining learners' attention for extended periods.[2]

There is a wide range of studies and reviews available in Game-based learning in medicine, catering to various application scenarios and user groups. Medical educators face the challenge of discovering innovative methods to enhance the learning experience, making it more engaging, motivating, and enjoyable. In the past, experts in medical education have suggested teaching methods that involve students actively participating in their learning, known as learner-centered education. This approach has been widely recognized and supported in the field.[3]

The integration of digital educational games into traditional medical education, such as the GBL platform, is a recent development aimed at enhancing the learning experience for medical students. This platform offers a more interactive and engaging approach to education. Crossword puzzles, hidden messages, word scrambles, and word searches have always been a source of motivation for students.[4]

The objective of this study was to examine the impact of a game-based learning approach on the knowledge of medical students.

Aim and Objectives

Aim: To evaluate the impact of integrating GBL (Game Based Learning) with traditional lectures in the learning amongst Phase 3 part 1 MBBS students in the subject of Paediatrics.

Objectives

1. To compare improvement in the cognitive domain of learners in GBL method of teaching as compared to the traditional method.
2. To compare the satisfaction of learners regarding GBL vs traditional learning.

Materials & Methods

This cross-sectional study was conducted over two months at a tertiary care hospital and medical college in Eastern India, following approval from the Institutional Ethics Committee (IEC). All ethical protocols were strictly adhered to, ensuring the protection and rights of learners and other study participants.

Sampling Frame: Phase 3 part I MBBS learners in a Medical College and tertiary care Hospital in Eastern India.

Sampling Technique: Convenient sampling.

Sample Size: 60

Sampling Process: Phase 3 part I MBBS learners.

Inclusion Criteria: Phase 3 Part I MBBS learners who voluntarily agreed to participate in the study.

Exclusion Criteria

1. Learners who were absent on the day of sessions.
2. Learners who did not give consent to participate in the study or withdraw their consent at any stage.

Study Procedure

Learners who participated in the study were divided into two groups (Group A and Group B) using convenient sampling. Both groups were taught the same topic (Topic 1) through different methods-Group A received a traditional lecture, while Group B experienced a Game-Based Learning (GBL) integrated lecture. A pre-test was conducted at the beginning of the session, followed by a post-test at the end to assess knowledge acquisition.

The performance of learners in both groups was evaluated based on their pre- and post-test scores to measure improvement. The score improvements of learners exposed to GBL were compared with those taught through traditional methods alone.

In the next session, a crossover occurred-Group A underwent a GBL session, while Group B received a traditional lecture on Topic 2. Both groups again took pre- and post-tests, and the results were analyzed accordingly. At the end of each session, both the GBL and traditional learning groups were given the Driscoll Questionnaire to assess their satisfaction with the respective teaching methods (Annexure 1).

The GBL methods used in the study included the Quizziz app for MCQ-based assessments and crossword puzzles with hint-based questions.

Statistical Analysis: The paired t-test was used to compare pre and post-test scores within each group, while the unpaired t-test was applied to assess the difference in score improvements between the two groups. Satisfaction scores between the GBL and traditional methods were analyzed within each group using the Wilcoxon signed-rank test. A p-value < 0.05 was considered statistically significant for all tests.

Results

This study evaluated the effectiveness of Game-Based Learning (GBL) compared to Traditional Learning (TL) among Phase 3 Part I MBBS students in paediatrics education by analyzing pre- and post-test scores along with student satisfaction levels. Participants were divided into two groups: Group A and Group B. Each group experienced both teaching methods in two separate sessions. GBL was implemented using crossword puzzles and the Quizizz app, while TL relied on conventional tutorials. The statistical analysis focused on learning gains measured through pre- and post-test performance using

paired t-tests and intergroup comparisons with independent t-tests. Satisfaction levels were analyzed using a Likert-scale-based survey, summarized with descriptive statistics.

Session-wise Learning Outcomes (Paired Comparisons): The paired t-test results demonstrated that students exposed to GBL showed statistically significant improvement in their cognitive test scores across both sessions. In Session 1, Group B (GBL1) showed a significant increase in their post-test scores with a p-value of 0.02, confirming a meaningful learning gain. Conversely, Group A (TL1), which received the traditional lecture format in the same session, did not show a statistically significant difference between pre- and post-test scores ($p = 0.39$). This result implies that the traditional teaching approach did not yield a measurable academic improvement during this session.

Figure 1

In Session 2, the teaching strategies were reversed between the two groups. Group A (GBL2) received the GBL intervention and showed a highly significant improvement in post-test performance ($p = 0.001$), marking the most notable gain in the study. This striking result points to the strong educational impact of GBL when used with appropriate instructional design and student engagement strategies. On the other hand, Group B (TL2), which transitioned to the traditional learning format in Session 2, showed a moderate but statistically significant improvement ($p = 0.02$). While this suggests that traditional learning can still contribute to academic gains, its impact appears to be less robust and less consistent compared to GBL.

Between-Group Comparisons (Independent t-tests)

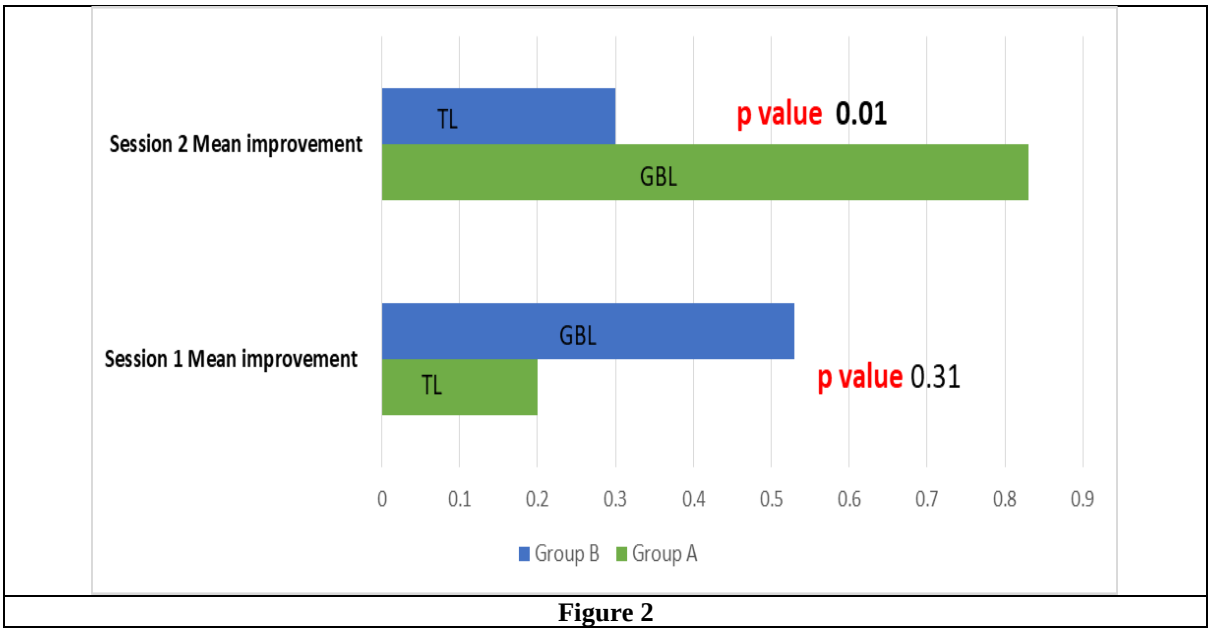

Figure 2

To evaluate the comparative effectiveness of GBL and TL in each session, mean improvements in test scores were assessed between the groups. In Session 1, Group B (GBL1) achieved higher average gains than Group A (TL1). However, the difference between the groups was not statistically significant, with a p-value of 0.31. This result may reflect early-stage learner adaptation to GBL or a novelty effect that did not fully translate into measurable superiority at this stage.

In contrast, Session 2 presented a more distinct picture. Group A (GBL2) significantly outperformed Group B (TL2), with a p-value of 0.01, indicating a statistically significant difference in learning gains between the teaching methods. This suggests that GBL may yield enhanced effectiveness over time, potentially due to increased student familiarity with the format, deeper cognitive engagement, or more refined game mechanics in the second session. These results indicate that repeated exposure to GBL may amplify its educational benefits, making it an effective long-term strategy.

Overall Analysis of Teaching Modalities

When combining the outcomes from both sessions, a clear pattern emerged. Game-Based Learning consistently led to more substantial improvements in knowledge acquisition as measured by post-test scores. The statistically significant outcomes observed in both GBL sessions contrast with the mixed results seen in traditional learning, where one group (TL1) failed to achieve significant gains. This underscores the robustness and adaptability of GBL as an instructional tool. Additionally, the variance in traditional learning outcomes could be attributed to external factors such as instructor variability, student motivation, or content delivery methods, which may be less engaging and more passive.

Satisfaction Survey Results

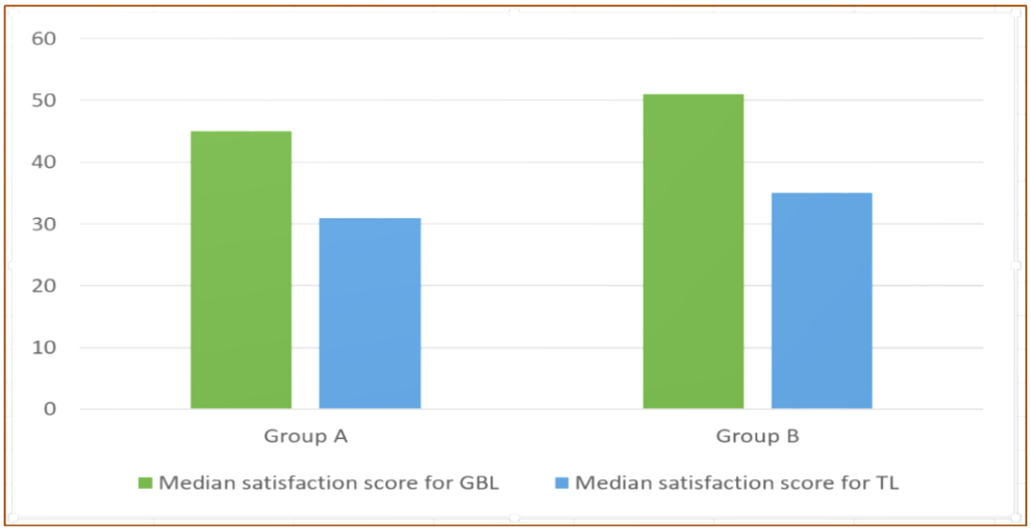

Figure 3

To complement the academic performance data, a student satisfaction survey was conducted to gauge the affective dimension of the two teaching methods. The survey utilized a 5-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree" across multiple domains: perceived engagement, enjoyment, clarity of concept, motivation to learn, and overall preference.

The results showed that both Group A and Group B reported higher median satisfaction scores for GBL compared to TL. This trend was consistent across all dimensions of the survey. Notably, Group B, which experienced GBL in Session 1, expressed slightly higher overall satisfaction scores than Group A. This discrepancy may be attributed to differing learning environments, prior exposure to similar tools, or student demographics. It is possible that Group B's early exposure to GBL primed them to develop a more favorable attitude toward this learning method.

The interactive and enjoyable nature of GBL was frequently cited in the qualitative feedback as a welcome change from the monotonous format of traditional lectures. Students appreciated features such as immediate feedback, peer interaction, and the competitive elements inherent to quiz-based games. The use of lifelines and randomized participation increased attentiveness and reinforced classroom material, thereby enhancing the perceived utility of the learning sessions.

Correlation between Satisfaction and Learning Outcomes

Although direct statistical correlation between satisfaction scores and academic performance was not calculated in this phase of the study, a positive trend was observed. Students who reported higher satisfaction with GBL also tended to perform better in post-tests. While this relationship is not conclusive, it supports the growing body of evidence suggesting that learner engagement is a critical factor in academic success. Future research may explore this link further by integrating correlation or regression analysis to quantify the influence of satisfaction on performance.

Implications for Medical Education

The findings from this study align with broader educational trends that advocate for active learning strategies in medical education. The consistency of GBL in improving test scores and satisfaction across both sessions and both groups suggests its scalability and adaptability in diverse educational settings. Moreover, the greater effectiveness of GBL observed in the second session points to a possible cumulative benefit as students become more familiar with the learning format. It may also suggest that GBL is particularly well-suited for complex or application-based topics within paediatrics.

Conversely, the inconsistent performance of traditional learning methods highlights potential limitations in engaging today's medical students, who are increasingly accustomed to interactive and multimedia-based content. These findings support the integration of GBL as a complement-if not an alternative-to traditional tutorials, especially when instructional goals emphasize application, retention, and active participation.

Discussion

Our study assessing the integration of game-based learning (GBL) through crossword puzzles and the Quizizz app into paediatrics teaching for Phase III Part I MBBS students showed improved cognitive outcomes, engagement, and student satisfaction compared to traditional tutorials. These findings are in concordance with other published studies that have explored GBL in medical education. For instance, a study by Gudadappanavar et al. on pharmacology education for Phase II MBBS students demonstrated that students in the GBL group showed a statistically significant improvement in post-test scores (mean gain of 39.53%) compared to the traditional group (mean gain of 18.43%).[5] This aligns closely with our observed post-test outcomes, reinforcing that GBL fosters more effective knowledge acquisition. Similarly, Moy et al. used a "Who Wants to Be a Millionaire"-style quiz format to teach pulmonary physiology and reported that students not only performed better academically but also found the sessions enjoyable and engaging.[6] This supports our inclusion of interactive lifelines and quiz-style gameplay, which encouraged active participation and attentiveness throughout the session. Several other studies across various domains of medical education reflect similar benefits. A randomized trial that implemented a diabetes-themed board game for undergraduate medical students found significant improvement in post-test performance and high learner engagement.[7] In another study evaluating the effect of a COVID-19 serious game among medical students, it was found that although both GBL and traditional teaching improved knowledge, the GBL group had better retention over time.[8] This reflects the growing evidence that GBL is not only effective in the short term but also has the potential to enhance long-term memory retention. However, contrasting results have also been reported. In some studies, while GBL improved student motivation and satisfaction, the traditional lecture format was slightly more effective in boosting long-term retention, particularly when the games lacked reinforcement or were not followed by debriefing sessions.[9] This insight is valuable, suggesting that GBL must be supported by proper instructional design, follow-up assessments, and integration into the curriculum to maximize its effectiveness. From the affective learning perspective, our study observed that students found GBL sessions more dynamic, enjoyable, and less monotonous compared to traditional lectures. This is supported by the findings of Smith et al., who showed that MBBS students using Kahoot and Quizizz reported higher motivation and better engagement.[10] Another study by Sailer et al. emphasized that game mechanics such as feedback, competition, and interactivity, when aligned with learning objectives, greatly enhance student satisfaction.[11] The collaborative elements of our GBL design, such as the use of lifelines that encouraged peer interaction, mirror findings from simulation-based education studies where teamwork and communication skills were significantly improved.[12,13]

Beyond content mastery, learners reported heightened enjoyment, collaboration, and motivation in the GBL setting. Insights from our participants align with broader literature noting that GBL fosters interactive educational spaces that appeal more than Lecture-Based Learning (LBL). For instance, medical students in an ophthalmology context expressed high satisfaction and increased motivation when gamification methods were employed which were similar to our results.[14]

Although our study highlighted significant short-term cognitive gains, several systematic reviews caution that while short-term outcomes favour GBL, long-term retention may not substantially differ from traditional methods. For example, some simulation-based educational strategies in paediatrics produce rapid skill gains which may fade without ongoing reinforcement. To ensure longitudinal impact, future GBL programs should include periodic

refreshers, integrated curricular alignment, and scaffolded re-testing.[15]

Across the board, studies consistently highlight that GBL facilitates active learning and peer collaboration, in contrast to the passive nature of didactic lectures.[16] In summary, the outcomes of our study are consistent with a growing body of literature demonstrating that GBL interventions in MBBS students promote superior short-term cognitive gains, increased student motivation, and improved collaboration. Nonetheless, there is a consensus in the literature that the sustainability of these gains depends on thoughtful game design, integration into the curriculum, and post-session reinforcement. Future research should aim at evaluating long-term knowledge retention, the scalability of GBL in different medical subjects, and the cost-effectiveness of such interventions in resource-constrained environments.

Conclusion

This study found that students viewed game-based learning (GBL) as an effective approach to increase student engagement and interest in the health sciences. Participants noted that GBL boosted students' motivation to engage in classroom tasks and improved their ability to retain course content, which may contribute to better academic performance. Drawing from the perspectives of both educators and learners, the findings suggest that GBL has the potential to enhance traditional teaching by creating an interactive and low-risk environment where students can practice essential skills. Participants shared their personal experiences with GBL, highlighting their roles and enthusiasm for the method. These insights are in line with previous studies, reinforcing the reliability of our conclusions. The majority of students in our study regarded GBL as an innovative and dynamic learning tool that enriched their educational experience. They appreciated its interactive and enjoyable nature, highlighting it as a welcome departure from the monotony of traditional didactic lectures. Additionally, students recognized that solving questions reinforced classroom learning while fostering a collaborative and engaging study environment.

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Ethical Considerations

The study included a vulnerable population that is learners / students from the Medical College participating in a study conducted by a faculty member of the same Institution. Learners were counselled and provided assurance that participating in the study was totally voluntary and not consenting to participate shall not jeopardize their academic evaluation or relationship with the faculty or the Institute in any way. They were also assured that even after consenting to participate, they had full liberty to withdraw during the study.

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