

EFFECTIVENESS OF GAMIFICATION IN ENHANCING ACADEMIC PERFORMANCE AMONG PHASE III MBBS STUDENTS IN A MEDICAL COLLEGE IN MADURAI.: A QUASI-EXPERIMENTAL STUDY

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ABSTRACT

Background: Gamification, which involves incorporating game-like elements into educational settings, presents a strategic method to enhance motivation, active involvement, and academic success. Few medical undergraduate students consider many subjects as over-theoretical. Although widely acknowledged worldwide, there is limited evidence of its use in Indian undergraduate medical education. **Objectives:** To evaluate the impact of gamified teaching methods on academic performance, engagement, and information retention among Phase III MBBS students compared to conventional lectures. **Materials and Methods:** A quasi-experimental study was carried out at the Institute of Community Medicine, Madurai, with 50 Phase III MBBS students split into an intervention group (receiving gamified instruction through tools like Kahoot, Mentimeter, and Educaplay) and a control group (receiving traditional lectures). Evaluation involved 20-item MCQ tests and a 5-point Likert scale to assess engagement across five areas. **Results:** The group exposed to gamification (n=25) showed significantly better academic results, with 56% attaining "High" scores (16–20), while none in the traditional group (n=25) reached this level ($p < .001$). Engagement measures, such as participation, attentiveness, and recall, were consistently superior in the gamified group ($p < .001$). Qualitative feedback indicated that students appreciated the healthy competition and enjoyable atmosphere, though technical issues like internet connectivity posed challenges. **Conclusion:** Gamification greatly improved higher-order cognitive processing and student motivation in our study. Incorporating digital game-based elements into the medical curriculum effectively connects academic knowledge with practical application, provided that institutional infrastructure supports these innovative teaching approaches.

INTRODUCTION

Implementing gamification in learning can increase students' interest and motivation to participate in the subject matter, improve their concentration and enjoyment of learning, and aid in effective learning. Gamification of learning is the process of using game elements to modify training content and methodology to help develop student potential and provide positive encouragement to boost their performance level.^[1] Medical undergraduates often perceive Community Medicine as overly theoretical, despite their importance in building population health skills. The gamification of learning increases student enjoyment, motivation and engagement in learning tasks.^[2] Gamification—the strategic use of game elements in educational contexts—has shown promise in

improving student motivation and outcomes in medical education globally.

These outcomes are also desirable in education, where interactivity, active participation, and competitiveness are essential to motivate and engage students. However, in order to fully understand the power of gamification in education, it is necessary to study in depth the game elements that can be used and how they can support the learning process.^[3] Despite its potential advantages, the successful integration of gamification in medical education depends on the acceptance of educators.^[4] The application of gamification in medical education will be more effective.

To justify, Traditional teaching frequently lacks an engaging, interactive element, which makes students less attentive. Gamification can boost academic

performance, encourage competition and teamwork, and increase cognitive engagement. Gamification improves student performance and cost awareness in clinical settings, according to evidence from related studies. In addition to adding to the expanding corpus of research on game-based learning, the study's conclusions will provide useful information for educators and legislators looking to improve medical education through creative teaching methods.

Objectives

1. To assess the effectiveness of gamified teaching strategies in improving academic performance in Community Medicine among Phase III MBBS students.
2. To assess the effectiveness of recall and engagement levels between students taught using gamified methods versus traditional lectures.

MATERIALS AND METHODS

This is a quasi-experimental, non-randomised controlled study conducted in the Institute of Community Medicine, Madurai.

- Participants: MBBS Phase III students (n ≈ 50), divided into two comparable groups:
- Intervention group: receives gamified instruction (e.g., point-based quizzes, leaderboards, rewards).
- Control group: receives conventional didactic lectures.
- Apps like Crossword puzzles, Educaplay, were used & the questions were gamified and responses from the students will be recorded.
- Study Period: 4 months.
- Topics Covered: Selected core modules of Community Medicine (Communicable & Non-Communicable diseases).
- Assessment:
 - Test scores (MCQ-based, 20 items).
 - Student engagement scale (5-point Likert scale, validated).

Outcome Measures

- Primary Outcome: Mean change in test scores (pre- vs. post-intervention) between the two groups.
- Secondary Outcome: Engagement levels and effectiveness of recall after 2 weeks post-intervention.

RESULTS

The study involved 50 Phase III MBBS students, who were evenly split into two groups: the Gamification group (n = 25) and the Traditional group (n = 25). Participants had an average mean age of the study participants is 20.20±0.9 years, with males making up a slight majority at 52% as shown in Figure 1.

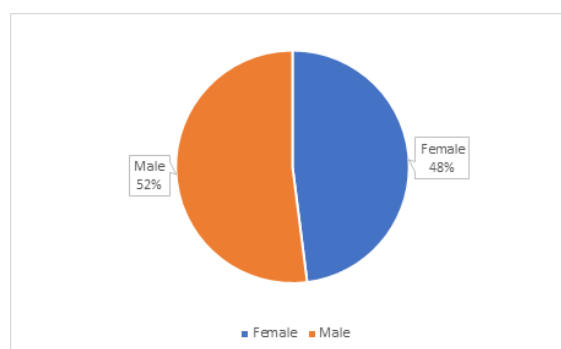


Figure 1: Gender distribution of study participants

The impact of gamification was evaluated by contrasting student perceptions with those of the conventional teaching approach across five primary areas: comprehension of the subject, active involvement, interaction, attentiveness, and memory/retention. Findings indicated that students in the gamification group reported notably higher levels of engagement and perceived learning than those in the traditional group. For example, all students in the gamification group rated their active participation as "High" or "Very High" (4 or 5 on the Likert scale), while all students in the traditional group rated it as "Low" or "Moderate" (2 or 3). This pattern was observed consistently across all educational domains (p<.001).

Table 1: Comparison of Student Perceptions: Gamification vs. Traditional Method

Perception Domain	Group	Low-Moderate (n)	High-Very High (n)	p-value	Chi square value[χ²] (df)
Understanding of Topic	Gamification	3[12]	22[88]	< .001	19.38 (3)
	Traditional	17[68]	8[32]		
Active Participation	Gamification	0[0]	25[100]	< .001	50.00 (3)
	Traditional	25[100]	0[0]		
Interactive Learning	Gamification	0[0]	25[100]	< .001	50.00 (3)
	Traditional	25[100]	0[0]		
Recall & Retention	Gamification	0[0]	25[100]	< .001	50.00 (3)
	Traditional	25[100]	0[0]		

Table 2: Distribution of Test Scores: Gamification vs. Traditional Method

Score Range	Gamification (n = 25) (%)	Traditional (n = 25) (%)	Total (N = 50) (%)	Tests
0-10 (Low)	0 (0)	5 (20)	5 (10)	Chi square = 21.613,

11–15 (Moderate)	11 (44)	20 (80)	31 (62)	df = 2, p < .001.
16–20 (High)	14 (56)	0 (0)	14 (28)	
Total	25 (100)	25 (100)	50 (100)	

There is a statistically significant association between the teaching method and academic performance ($p < .001$). Notably, 56% of students in the gamification arm achieved "High" scores (16–20), whereas none in the traditional arm did.

Feedback on Gamification

Students shared their thoughts on the qualitative elements of the gamified sessions, pointing out specific factors that drove engagement and obstacles to implementation.

Positive Reinforcements: The most appreciated features were "Increased engagement" (26%), "Healthy competition among peers" (12%), and "Enjoyable learning environment" (12%).

Challenges: Although 62% encountered no issues, "Internet problems" (26%) were identified as the main technical hurdle.

Suggestions for Improvement: A significant majority (92%) recommended extending the duration of the gamified sessions.

Future Utility: 58% of participants expressed a desire for more gamified sessions in Community Medicine, while 20% proposed a hybrid model that combines gamification with traditional lectures.

The findings demonstrate a clear advantage of gamification over conventional didactic methods in the context of Phase III MBBS Community Medicine. The academic results indicate that gamification enhances higher-order cognitive processing, elevating students from "Moderate" to "High" performance levels. The statistical significance ($p < .001$) across all engagement metrics—Recall, Attentiveness, and Participation—supports the notion that game-based elements (competition, immediate feedback, and interactivity) boost motivation. However, the qualitative feedback regarding "Internet problems" and the call for "more duration" highlights the necessity for reliable institutional infrastructure and careful scheduling to effectively incorporate these digital strategies into the standard medical curriculum.

DISCUSSION

The results of our research indicate that gamification greatly boosts both student involvement and academic success among Phase III MBBS students studying Community Medicine. The main finding highlighted a significant difference in cognitive achievement: 56% of students in the gamified group achieved high-tier scores (15–20), a level not reached by any students in the traditional group. In contrast, failing or low-tier scores (0–10) were only found in the traditional lecture-based group. These findings strongly suggest that gamified elements shift the learning experience from passive reception to active cognitive engagement.

Impact on Academic Performance and Retention

The notable improvement in test scores ($p < .001$) is consistent with a broader meta-analysis of 30 independent quantitative interventions, which found that gamification provides a medium effect size benefit for academic performance (Hedges $g = 0.504$) compared to non-gamified methods.^[5]

Our findings are in line with those of Abirami et al,^[4] who found that students using Kahoot-based assessments scored significantly higher and viewed the method as an essential tool for simplifying complex medical topics. The fact that 100% of the gamification group in our study reported high recall and retention indicates that the competitive and interactive nature of the intervention effectively aids in transferring information into long-term memory.

Student Engagement and Motivation

Student feedback in this study was overwhelmingly positive, with 100% of participants in the intervention group reporting "High" or "Very High" levels of active participation and enjoyment. This reflects the views of medical educators surveyed by Abirami et al,^[4] where 85% of faculty agreed that gamification boosts engagement and 89% emphasized its role in promoting active learning.

From a theoretical perspective, these results can be explained through Self-Determination Theory (SDT), which suggests that successful gamification meets the three basic psychological needs: competence, autonomy, and relatedness.^[6,7] By offering rapid feedback and visible progress through scoring, our intervention likely enhanced students' sense of competence. Additionally, the "healthy competition" mentioned by 12% of our students as a favorite feature aligns with the "relatedness" aspect of SDT, where peer-to-peer comparison encourages learning through social influence.^[7]

Barriers and Technical Considerations

Despite the academic improvements, our study identified significant technical challenges, with 26% of students citing internet connectivity as a primary issue. This concern is echoed in international literature; as mentioned by Lester et al 5(2020) noted that internet connection challenges remain a major obstacle to the seamless implementation of gamified platforms like Kahoot in university settings. Furthermore, medical educators in South India identified technological limitations and time constraints for faculty (67.5%) as significant barriers to widespread adoption.^[4] This suggests that while students are highly motivated to participate—92% of our study participants suggested increasing the session duration—the sustainability of gamification depends on robust institutional infrastructure.

Comparison with Current Pedagogical Trends

Our research presents a contrast to earlier studies like the prevailing view today, bolstered by our findings

and the Delphi study by Wang et al.^[8] (2024), indicates that gamification, when aligned with educational goals, serves as a powerful teaching tool rather than just a source of entertainment. Unlike conventional lectures, which often fail to maintain student focus, our results revealed that all participants in the gamification group reported increased attentiveness, compared to none in the traditional group.^[4]

Implications for Future Implementation

A key insight from the qualitative feedback was that 58% of students expressed a preference for more gamified sessions in Community Medicine, while 20% advocated for a "hybrid" model where gamification enhances traditional lectures. This aligns with faculty views reported by Abirami et al.⁴, where 86% of educators supported a blended teaching approach. Such a hybrid model could address the "overjustification effect," where excessive reliance on external rewards (like points or badges) might diminish intrinsic motivation if learning objectives are not prioritized.^[9]

CONCLUSION

Research shows that gamification is a highly effective educational tool in medical training, offering more than just entertainment. It greatly enhances cognitive outcomes. The gamification group's consistent top performance underscores how elements like competition and active feedback help in retaining complex concepts. The significant p-values across all perception metrics indicate a fundamental shift in student engagement, transforming passive learners into active participants through gamification. However, the mention of technical difficulties and the suggestion for a blended approach (integrating lectures with gamification) imply that while this method excels in retention, its success depends on reliable infrastructure and its role as a complementary educational strategy. This study concludes that gamification is a more effective teaching method for improving academic performance and student engagement in compared to traditional lectures. The approach effectively links theoretical knowledge

with student interest. Future efforts should focus on overcoming technical challenges and integrating gamification as a core, rather than supplementary, component of the medical curriculum to ensure enduring knowledge retention and clinical proficiency.

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