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Original Research Article

Implementing Quiz Game As A Learning Tool in Biochemistry for Phase I Medical Students: A Study of Students and Teachers' Perception

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Abstract:

Background: Pre-clinical subjects like biochemistry in medical education often present challenges due to their conceptual complexity and extensive information volume, leading to suboptimal student engagement with traditional teaching methods. The shift towards Competency Based Medical Education (CBME) necessitates innovative, active learning strategies. Game-Based Learning (GBL) platforms, such as Kahoot! offer interactive quiz-based formats designed to enhance participation and formative assessment. This study aimed to evaluate the effectiveness and feasibility of Kahoot! as a learning tool in Phase I MBBS biochemistry, and to analyse student and faculty perceptions regarding its utility and implementation.

Methods: A 6-month descriptive, cross-sectional study was conducted at the Government Institute of Medical Sciences, Greater Noida, involving 99 Phase I MBBS students and 7 biochemistry faculty members. Kahoot! was integrated into standard biochemistry lectures for formative assessment, utilizing multiple-choice quizzes, competitive leaderboards, and audio-visual stimuli. Data on student and faculty perceptions were collected via a pre-validated Likert-scale questionnaire, and a Satisfaction Index (SI) was calculated for quantitative responses.

Results: Student perceptions demonstrated high satisfaction, with 92.8% feeling inspired to learn more, 95.21% desiring more quiz game lectures, and 93.04% agreeing it improved conceptual understanding. A significant majority (90.75%) found classroom activity engaging, and 89.54% supported its use in assessment. Faculty responses also showed strong support, with 97.6% finding Kahoot! more interesting than traditional didactic lectures and supporting its future inclusion. Additionally, 95.2% of faculty observed increased student engagement and participation and agreed Kahoot! could be effectively used in assessment.

Conclusion: The study concludes that Kahoot! is a feasible, effective, and well-received learning tool in Phase I MBBS biochemistry. Its successful integration significantly enhances student engagement, interaction, and conceptual understanding, while also providing valuable formative assessment opportunities. Both students and faculty expressed high satisfaction and strong support for its continued use, reinforcing its potential to enrich learning environments within a CBME framework.

Keywords: Kahoot! Gamification, Medical Education, Biochemistry, Formative Assessment, Student Engagement, Faculty Perception, MBBS, Active Learning.

Introduction

The Phase 1 subjects within medical education, particularly biochemistry, present challenges due to their conceptual complexity and the extensive volume of information that must be mastered by students. Traditional teaching methodologies can result in suboptimal student engagement and knowledge retention.[1,2] This challenge is amplified in large class settings where interactive opportunities are inherently limited.

The current shift towards a Competency Based Medical Education (CBME) is paradigm shift towards more learner-centric, active learning strategies that promote critical thinking, self-directed learning, and improved learning techniques. [3] This educational model, which focuses on outcomes and de-emphasizes time-based training, is well-supported by the integration of interactive learning tools.

In this context, A new Game-Based Learning (GBL) has emerged as an innovative and effective strategy. [4] Among the various GBL platforms, Kahoot! a game-based student response system, has been widely adopted in higher education. The platform enables instructors to design and administer interactive quizzes that students participate in using personal electronic devices. Its key features including a competitive leaderboard, immediate answer validation, and engaging audio-visual stimuli are designed to increase student participation and focus. As a formative assessment tool, it can also be used to summarize core concepts of what has been taught [1].

Therefore, the aim of this study was to examine the effectiveness and feasibility of the Kahoot! quiz game as a learning tool in biochemistry for Phase I MBBS students at the Government Institute of Medical Sciences (GIMS), Greater Noida. The specific objectives were to evaluate the effectiveness of Kahoot! for engaging students in the active learning process, and to analyze the perceptions of both students and faculty regarding the utility and implementation of the Kahoot! platform.

Material and Method

Study Design and Setting: A 6-month duration descriptive, cross-sectional study was conducted by the Department of Biochemistry at Government Institute of Medical Sciences. The study was approval from the Institutional Ethics Committee of GIMS Reference No. GIMS/IEC/HR/2024/38. Informed consent was obtained from all students of Phase I Bachelor of Medicine, Bachelor of Surgery (MBBS) 2023-24 academic year. Participants were assured that their involvement was voluntary, their responses would remain anonymous and confidential, and their decision to participate or decline would have no bearing on their academic assessment or professional standing.

Sample Size: The census sampling method was employed, and all 100 students enrolled in the Phase I MBBS were invited. Informed consent was taken from the 99 students and seven faculty members from the Department of Biochemistry, who were directly involved in designing and conducting the Kahoot! sessions. One student was excluded due to non-participation for personal reasons.

The Kahoot! Intervention

The intervention consisted of integrating Kahoot! a game-based student response system, into standard biochemistry lectures over a six-month period. The platform was utilized for formative assessment during lectures.

Faculty members developed a series of quizzes, each comprising 10 to 20 multiple-choice questions relevant to the lecture content. During designated class times, an invitation link or a unique game pin was provided to the students, who participated in live, time-bound challenges using their personal electronic devices (smartphones or laptops). To foster a competitive and engaging learning environment, gamification elements were employed; the top three performers for each quiz were acknowledged and recognized at the end of the course based on cumulative performance.

Data Collection Instrument: Data were collected from all participants using a pre-validated, structured questionnaire. The instrument was designed to assess perceptions regarding the effectiveness, feasibility, and engagement potential of the Kahoot! tool. The questionnaire consisted of items rated on a five-point Likert scale (ranging from 1 = Strongly Disagree to 5 = Strongly Agree), The anonymous survey was administered to both students and faculty to capture their respective viewpoints.

Statistical Analysis: The quantitative data obtained from the Likert scale responses were entered into Microsoft Excel and analysed using descriptive statistics.

Quantitative data from the Likert scale responses were analyzed to calculate a Satisfaction Index (SI) for each item. The SI was calculated using the formula:

$$SI = \frac{[(n_1 \times 1) + (n_2 \times 2) + (n_3 \times 3) + (n_4 \times 4) + (n_5 \times 5)]}{(n_1 + n_2 + n_3 + n_4 + n_5)} \times 20$$

Here, m represents the number of respondents for each corresponding Likert score. The SI provides a standardized score on a scale of 0–100, allowing for a clear interpretation of satisfaction levels.

Frequencies and percentages were calculated for each survey item to summarize the overall perceptions of the student and faculty cohorts.

Results

We conducted this study with an intent to evaluate the effectiveness of the Kahoot quiz game as a learning tool in biochemistry for Phase I MBBS students. Out of 100 students, 99 participated in the study. The one non-participation was due to illness or personal reasons. Students responded to a questionnaire regarding their perception towards Kahoot. Seven

faculty members also responded to the questionnaire to share their perception.

A 92.8% satisfaction was seen where students agreed that the quiz game tool inspired them to pursue further learning. SI was 95.21% where students agreed that more lectures should be conducted using quiz games. SI was 82.41% where students agreed that clarification on difficult concepts was provided by faculty during the quiz game. With 90.75%, students found classroom activity to be engaging. The students agreed that quiz game sessions improved their understanding of key concepts with SI of 93.04%. In addition, 91.48% of students agreed that they were adequately sensitized about the use of quiz games, while 89.47% reported that sufficient time was provided to explain the rules and method of participation. Nearly all respondents (94.63%) found the reading material relevant for the activity, and 91.46% considered the classroom arrangements, including seating and audiovisual facilities, conducive for participation. Finally, 89.54% of students agreed that quiz game tools could be effectively used as part of assessment Table 1 & Figure 1.

Table 1: Faculty feedback on the use of quiz game–based teaching tools. Responses were recorded on a 5-point Likert scale where 5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, 1 = Strongly Disagree. Values are expressed as n (%). The Median indicates the central tendency of responses, while the Satisfaction Index (SI) represents the overall proportion of positive responses on the Likert scale, expressed as a percentage

S.no	Question	Response on Likert scale					Median	SI
		5	4	3	2	1		
1	**Students were sensitized about quiz games**	54 (55.10)	40 (40.82)	4 (4.08)	0 (0.00)	0 (0.00)	5	91.48
2	**Adequate time was provided to explain the rules and method to use the quiz game tools.**	54 (55.10)	37 (37.76)	3 (3.06)	3 (3.06)	1 (1.02)	5	89.47
3	**Reading material was relevant for the classroom activity.**	71 (72.45)	26 (26.53)	1 (1.02)	0 (0.00)	0 (0.00)	5	94.63
4	**The classroom arrangements (positioning of the chairs for group activity, audio-visual facilities) were conducive for class.**	51 (52.04)	38 (38.78)	9 (9.18)	0 (0.00)	0 (0.00)	5	91.46
5	**The activities during Classroom quiz game session improved my understanding of the key concepts.**	64 (65.31)	26 (26.53)	6 (6.12)	2 (2.04)	0 (0.00)	5	93.04
6	**The quiz game session inspired me to pursue further learning for the module.**	63 (64.29)	23 (23.47)	9 (9.18)	3 (3.06)	0 (0.00)	5	92.80
7	**More lectures should be conducted using quiz games during lectures**	72 (73.47)	19 (19.39)	6 (6.12)	1 (1.02)	0 (0.00)	5	95.21
8	**Instructor was able to engage me in the classroom activity.**	54 (55.10)	37 (37.76)	5 (5.10)	2 (2.04)	0 (0.00)	5	90.75
9	**Instructor was able to provide clarification on difficult concepts during the quiz game Classroom activity.**	35 (35.71)	44 (44.90)	7 (7.14)	12 (12.24)	0 (0.00)	4	82.41
10	**Game quiz tools can be used in assessment.**	61 (62.24)	19(19.39)	10 (10.20)	5 (5.10)	3 (3.06)	5	89.54

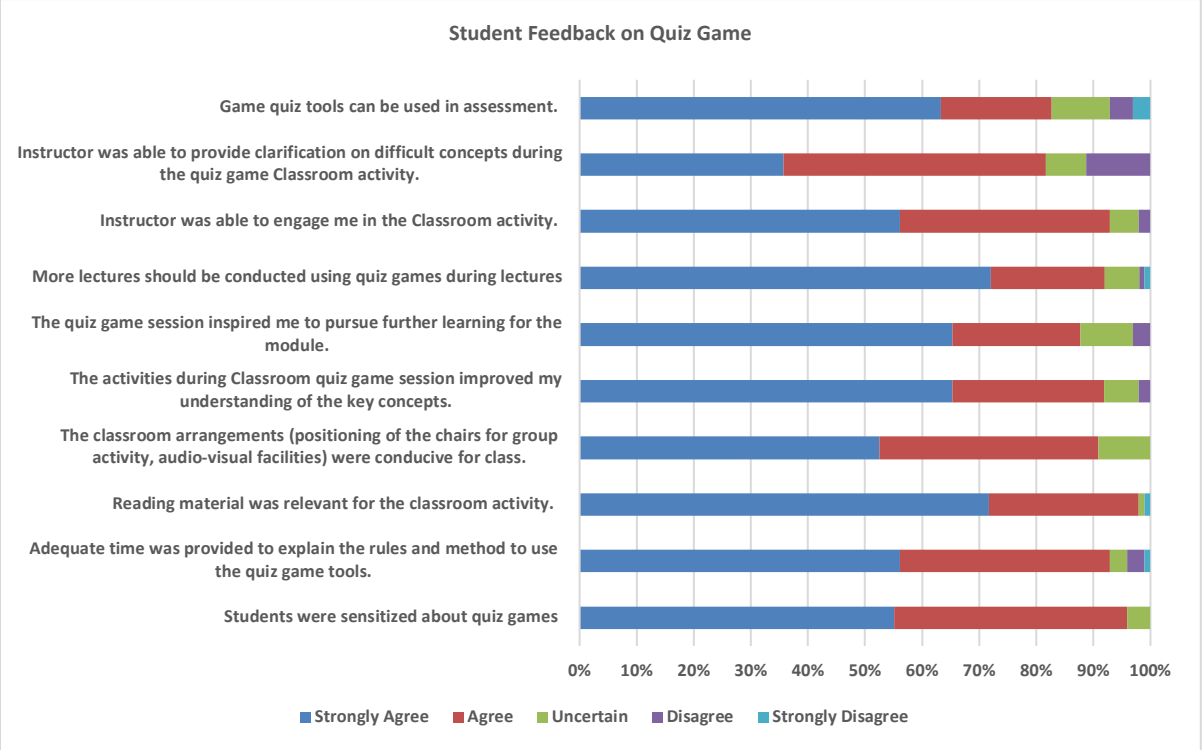

Figure 1: Student Feedback on Quiz Game

Faculty responses also reflected strong support for the quiz game sessions. A 95.2% satisfaction was noted regarding sensitization to the use of interactive teaching–learning tools, while 92.9% agreed that adequate time was provided to explain the rules and method of the quiz game. Relevance of the reading material and quizzes was endorsed by 95.2% of the faculty, and 90.5% considered the classroom arrangements conducive to carrying out the activity. Improvement in conceptual understanding during the sessions was acknowledged by 95.2% of the faculty. Notably, 97.6% agreed that the quiz games were more interesting than traditional didactic lectures, and the same proportion supported the inclusion of more such sessions in future teaching. Faculty also reported that the use of quiz games increased student engagement and participation with an SI of 95.2%. The lowest level of agreement was observed for clarification of difficult concepts during the sessions, with an SI of 88.1%, though this still indicated a positive perception. Finally, 95.2% of the faculty agreed that quiz game tools could be effectively used in assessment Table 2 & Figure 2.

Table 2: Faculty feedback on the use of quiz game–based teaching tools. Responses were recorded on a 5-point Likert scale where 5 = Strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree, 1 = Strongly Disagree. Values are expressed as n (%). The Median indicates the central tendency of responses, while the Satisfaction Index (SI) represents the overall proportion of positive responses on the Likert scale, expressed as a percentage

S.no	Question	Response on Likert scale					Median	SI
		5	4	3	2	1		
1	**PI sensitized the faculty about interactive teaching learning tools**	5 (71.4)	2 (28.6)	0 (0.0)	0 (0.0)	0 (0.0)	5	95.2
2	**Adequate time was provided to explain the rules and method to use the quiz game tools.**	4 (57.1)	3 (42.9)	0 (0.0)	0 (0.0)	0 (0.0)	5	92.9
3	**Reading material and quiz games were relevant for the classroom activity.**	5 (71.4)	2 (28.6)	0 (0.0)	0 (0.0)	0 (0.0)	5	95.2
4	**The classroom arrangements (positioning of the chairs for group activity, audio-visual facilities) were conducive for class.**	4 (57.1)	2 (28.6)	1 (14.3)	0 (0.0)	0 (0.0)	5	90.5

5	**The activities during Classroom quiz game session improved the understanding of the key concepts.**	5 (71.4)	2 (28.6)	0 (0.0)	0 (0.0)	0 (0.0)	5	95.2
6	**The quiz game session was more interesting than traditional didactic lectures.**	6 (85.7)	1 (14.3)	0 (0.0)	0 (0.0)	0 (0.0)	5	97.6
7	**More lectures should be conducted using quiz games during lectures**	6 (85.7)	1 (14.3)	0 (0.0)	0 (0.0)	0 (0.0)	5	97.6
8	**Quiz game was able to increase the engagement and participation of students in the classroom activity.**	5 (71.4)	2 (28.6)	0 (0.0)	0 (0.0)	0 (0.0)	5	95.2
9	**Faculty was able to provide clarification on difficult concepts during the quiz game Classroom activity.**	4 (57.1)	2 (28.6)	0 (0.0)	1 (14.3)	0 (0.0)	4	88.1
10	**Game quiz tools can be used in assessment.**	5 (71.4)	2 (28.6)	0 (0.0)	0 (0.0)	0 (0.0)	5	95.2

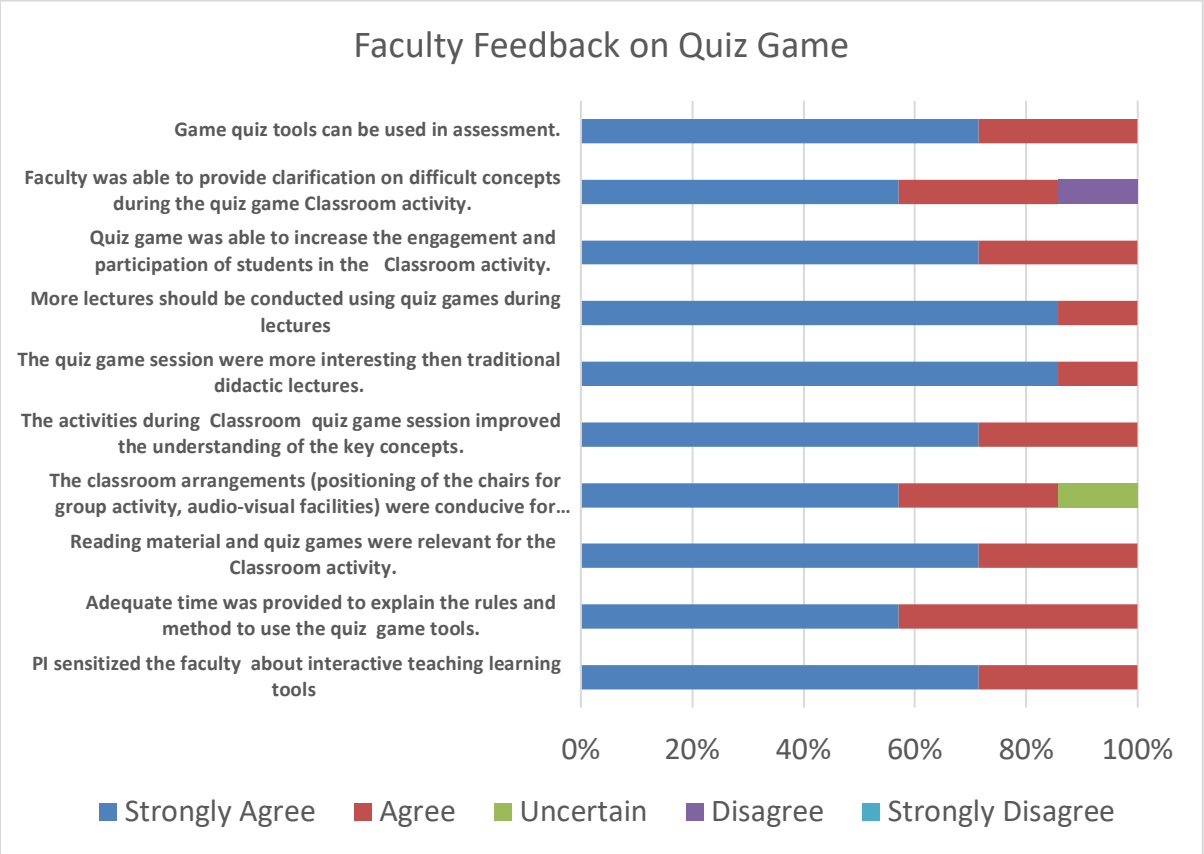

Figure 2: Faculty Feedback on Quiz Game

Discussion

There is a lot of evidence that understanding and academic results both improve if lectures are engaging (Prince 2007). With medical education shifting to CBME, interactive teaching-learning tools which keep students engaged are being used. As suggested by Caldwell (2007), SRS improve classroom dynamics, positive perception for students and instructors, and positive effect on exams.

In this study we have assessed the effectiveness of Kahoot for engaging students in the active learning process. Both students as well as faculty showed high satisfaction with Kahoot which can be considered a success. The students and faculty strongly agree that the quiz game tool has increased the interaction amongst them and the sessions were more engaging. Our finding is consistent with the study of Aljaloud et al., who summarized that quiz games provide interactivity and engagement in the classroom. Alfi, Lge, and Rabail Tabi in their review article reported that Kahoot increased interaction and involvement in lectures.

Additionally, evidence from a recent comprehensive meta-analysis indicates that Kahoot! is associated with a moderate positive effect on academic

achievement, a very large positive effect on knowledge retention, and a large positive effect on learner motivation, while also showing a small reduction in anxiety, reinforcing its suitability as an engagement-oriented, formative tool in health professions education (Özdemir, 2025; Donkin and Rasmussen, 2021; Ismail et al., 2019) [3–5].

Within medical and biomedical courses, objective improvements have been documented: in (histo-)pathology teaching, correct response rates increased from roughly mid-40% to mid-70% and response times decreased by about half following Kahoot! -supported sessions, demonstrating both accuracy and efficiency gains during knowledge retrieval (Neureiter et al., 2020; Elkhamisy and Wassef, 2021) [6,7]. A scoping review focused on histology, anatomy, and medical education further reports consistently positive student perceptions and several studies showing improved outcomes or enhanced engagement when Kahoot! is used to structure formative activities (Donkin and Rasmussen, 2021; Youhasan and Raheem, 2019). [5,8]

Beyond perceptions, Kahoot! performance has been shown to correlate with and predict summative examination results, suggesting practical value for early identification of at-risk learners and difficult content and aligning with programmatic assessment aims in CBME (Garza et al., 2023; Neureiter et al., 2020). [6,9]

The platform's design affordances also support formative use at scale: item-by-item feedback and downloadable analytics enable instructors to review misconceptions, track progress, and target remediation at the cohort and individual levels (Ismail et al., 2019; Neureiter et al., 2020). [4,6] Importantly, team-based play can amplify learning effects through peer explanation and collaborative reasoning; in histology cohorts, team mode produced stronger gains than individual play, implying that structured collaboration may be particularly useful for complex conceptual content (Donkin and Rasmussen, 2021). [5]

Findings from remote and blended implementations show that Kahoot! retains its motivational and feedback benefits online, with students reporting enjoyment, focus, and recommendations for continued use; however, challenges such as unstable connectivity and application switching can impede participation and require deliberate technical support and strong workflows (Lohitharajah and Youhasan, 2022; Youhasan and Raheem, 2019; Donkin and Rasmussen, 2021). [8,10]

Previous studies have shown that while Kahoot! is very engaging but it may not always help students understand difficult concepts when questions are asked under strict time limits. Adjusting the timer, giving short explanations after each question, and reducing the focus on speed-based scoring can help provide clarity without losing student interest (Ismail and Mohammad, 2017; Lohitharajah and Youhasan, 2022) [10,11]. Although this and other studies report good acceptance and perceived learning benefits, more rigorous research with pre- and post-tests, as well as delayed assessments, is needed to measure the real effect of Kahoot! on knowledge gain and long-term retention in biochemistry and other preclinical subjects (Neureiter et al., 2020; Elkhamisy and Wassef, 2021; Garza et al., 2023) [6,7,9].

In addition, studies extending Kahoot! to skill-based teaching have shown positive results. For example, its use with online education improved nursing students' knowledge and skills in intramuscular injections, and gamified continuing medical education with Kahoot! enhanced nurses' performance in medication practices and increased their satisfaction, showing its usefulness in both cognitive and practical training (Özaras Öz and Ordu, 2021; Ghafouri et al., 2025) [2,12].

Conclusion

Our study demonstrates that Kahoot! is a highly feasible and effective game-based learning tool for Phase I MBBS biochemistry, it shows positive perceptions from both students and faculty. Its integration notably enhanced student engagement, active participation, improved conceptual understanding, and provided valuable formative assessment opportunities within large-group lectures. These findings underscore Kahoot's potential to create a more dynamic and interactive learning environment, aligning well with the principles of Competency Based Medical Education by promoting a learner-centric approach. The high satisfaction reported by both student and faculty cohorts strongly supports the continued and expanded use of Kahoot! in medical education.

While the current findings are focused on highlighting the perceived benefits and feasibility, future research is essential to further quantify its educational impact. It is recommended that subsequent studies incorporate more rigorous methodological designs, including pre- and post-intervention analyses of objective knowledge acquisition and long-term retention. Such studies should also explore the differential effects of various Kahoot! implementation strategies (e.g., individual vs. team-based play, varied question types), analyze performance correlations with summative assessments, and consider its scalability across different medical disciplines and diverse student populations to build a comprehensive evidence base.

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