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Pharmacology quiz as a competency based learning tool for undergraduates: Assessment of students' attitude and feedback

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ABSTRACT

Context: Apart from knowledge and skills, attitudes also shape the overall competency of a medical graduate. Quiz based learning is a refreshing way of implementing competency based exercises in Pharmacology.

Aim: To assess the attitude of second year MBBS students and obtain feedback about pharmacology quiz.

Materials and Methods: Fifty-four second year MBBS students were included in the study and divided into 6 groups of 9 each. A well-designed questionnaire with ten statements was used to assess the attitude of the students, responses were recorded as five point Likert scale and scored on a scale of 1 to 5 (strongly agree:5, agree:4, neutral:3, disagree:2 and strongly disagree:1). Mean score for each statement was graded (mean score >3: positive attitude, score =3: neutral; score <3: negative).

Results: The students had an overall positive attitude towards the quiz (mean attitude scores for all the statements was >3). They found quiz interesting (mean score: 4.71 ±0.48), allowed for healthy competition and teamwork (mean score: 4.58 ±0.60), as a refreshing way of learning and breaks the monotony (mean score: 4.47±0.79), improved student-teacher interaction (mean score: 4.48±0.69). Students' feedback showed (indicated as strongly agree/agree: n, %): rounds in the quiz were interesting (52, 96%), allowed for fair chance of participation for all (45, 83%), improved peer-interaction (50,92%), helpful for examinations (52,95%) especially for viva-voce (34,63%). Crossword (21, 38%), rapid fire (10, 21%), identification of Adverse drug reactions (9, 16%) and jigsaw puzzle (5, 9%) were the favorite rounds for the students.

Conclusion: Students had a positive attitude and feedback was encouraging. Quiz improves peer interaction, decision-making, confidence, analytical skills, working under pressure and effective communication, regular quiz exercises and assessments can be an effective competency based learning tool for medical undergraduates.

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1. Introduction

Competency based medical education (CBME) is defined as an outcome based approach to the design, implementation, assessment and evaluation of the medical curriculum program using an organized framework of competencies. It is learner centered, outcome based and unit of progression is mastery in the specific competency.¹ Competency is the

ability of a health professional that can be observed. It encompasses various components such as knowledge, skills, values and attitudes.²

CBME also improves learner's ability to recognize, manage and continuously build upon their own competencies and evidence of learning. CBME practices do not need to be dramatic, many effective approaches are being incorporated and are evolving within the existing curriculum.³ In Pharmacology, various active teaching-

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learning methods like problem based learning, case based learning, exist that aid to develop the competencies. For most of the methods, the assessment of outcome is knowledge based through pre and posttests scores or mean scores. The student may have an extra-ordinary knowledge but may lack the attitude and basic soft skills related to communication, professionalism, patient care.²

For effective implementation of a teaching-learning method, assessment of attitude and feedback of the students is also necessary. In the present study we chose quiz as an active learning method as it is different from routine methods, interactive, interesting, informative, provides scope for participation, peer interaction and improvement of communication skills etc. The objective of the present study was to assess the attitude and feedback of the students towards pharmacology quiz

2. Materials and Methods

Fifty-four second year MBBS students were included in the study. To assess the attitude of the students towards pharmacology quiz, a well-structured questionnaire containing ten statements was prepared referring from previously published studies^{4,5} and modified to suite the present study. The responses were recorded using a five point Likert scale with responses ranging from strongly agree to strongly disagree.

2.1. Scoring of the responses

The scoring of the responses was done as follows: For positive statements (statements 1-5, 7,10): Strongly agree: 5; Agree: 4; neutral:3; disagree:2; strongly disagree: 1 and for negative statements (statements 6,8 and 9): Strongly agree:1; agree:2; neutral: 3; disagree: 4; strongly disagree:5. The mean score was calculated for each statement and graded as Positive attitude (mean score >3), neutral attitude (mean score =3) and negative attitude (mean score<3). The feedback questionnaire had total of 8 questions and responses were recorded again on five point Likert scale response.

Both the questionnaires were given to the students after the completion of the quiz. They were given total of 15 min to answer the questionnaires without assistance. Approval from the institutional ethics committee was obtained and informed consent was obtained from all the study participants prior to the start of the study after explaining the procedure and purpose of the study.

2.2. Conduction of the quiz

Students were divided into 6 groups of 9 students each. The grouping was based on the average academic performance of students during the entire second year course- students with the highest scores were grouped with students with lowest and average scores. Grouping was done 4 weeks

prior the conduction of the quiz so that students prepare and work as a team. The pharmacology quiz is conducted at the end of the academic year for second year MBBS students after completion of theory and practical curriculum. The quiz consists of total 15 rounds. Each round consisted of six questions, right answer was given a score of 2 and wrong answer, a score of zero. The questions covered the important topics in pharmacology, questions were related to recall, reasoning, both clinical and concept based and were chosen such that they had one-word answers or required simple reasoning. To break the monotony, cross word (identifying drugs given as incomplete crosswords), jigsaw puzzle with subtle clues for identification of medicinal plants, identification of ADRs (adverse drug reactions) through pictures, identification of pharmacology textbooks based on their front cover pictures, toxiplay (identification of drug poisoning and their antidotes), identification of scientists /pioneers in pharmacology based on their contributions were included. In all the rounds, each question was given 2 minutes for answering. The last round was the rapid fire round with 10 questions in 2 minutes for each group.

Table 1: Rounds in the quiz

S.No.	Name of the rounds	S.No.	Name of the rounds
1	General Pharmacology	9	Identification of text books
2	ANS	10	Toxiplay
3	CVS	11	Scientists
4	CNS	12	ADRs
5	Chemotherapy	13	Crossword
6	Endocrines	14	Jigsaw puzzle for Medicinal plants
7	Gastrointestinal tract	15	Rapid fire
8	Respiratory system		

*ANS – Autonomic nervous system

CVS- Cardio-vascular system

CNS – Central nervous system

ADRs- Adverse drug reactions

2.3. Statistical analysis

The data was analyzed using descriptive statistics namely mean and standard deviation.

3. Results

Table 2 shows the demographic characteristics of the study participants and the details of their preparation for the quiz. The mean age was 21.6 ± 1.01 years with 63% (n=34) females and 37% (n=20) males. Eighty-four percent (n=45) had prior preparation for the quiz and 16% (n=9) hadn't come with prior preparation. 57 % (n=31) prepared as a team and 27 % (n=14) prepared alone. 63% (n=34) students had participated in the quiz competitions previously and 37% (n=20) had no previous experience of

quiz participation.

Table 2: Demographic features and preparation for quiz

Parameters	n (%) Total: N=54
Mean age	21.6± 1.01 years
Gender	
Male	20 (37)
Female	34 (63)
Mean Duration of preparation for quiz	3.8± 4.04 days
Prepared as	
Alone	14 (27)
Team	31 (57)
Not prepared	9 (16)
Previous participation in the quiz	
Yes	34 (63)
No	20 (37)

Table 3 Shows the responses of the students towards the ten attitude based statements. Majority of the students agreed that quiz made the subject interesting (strongly agree:39,72 %; agree:14, 26%), was a refreshing way of learning (strongly agree:33,61%; agree:15,27%), allows for healthy competition and team work (strongly agree: 35,64%; agree:16,30%), encouraged participation and learning (strongly agree:39,72%; agree:12,22%), and useful for exams (strongly agree:31,57 %; agree:15, 27%). As evident in the table, many students disagreed for the negative statements i.e. statements 6, 8 and 9.

Tables 5 and 6 show the feedback responses of the students towards the quiz conducted in our department. Majority of the students found the rounds in the quiz interesting (strongly agree: 31, 57 %; agree: 21, 38 %), allowed for team work and peer interaction (strongly agree: 32,59 %; agree:18,33%) and felt it will be useful for exam preparations (strongly agree: 30,55%; agree: 22,40%). Forty-five (83%) of the students felt prizes given were satisfactory. About the level of difficulty of the questions (tough questions) 59% (n=32) were neutral and 31%(n=17) agreed that questions were tough. Ninety-seven percent (n=52) opined that organization and execution of the quiz was satisfactory.

Crossword (n=21, 38%) rapid fire (n=10, 19%) ADR identification (n=9, 16%), Toxiplay (n=5, 9%) and Jigsaw puzzle (n=5, 9%) were among the favorite rounds for the students. The Easiest rounds included crossword (n=17, 31%), general pharmacology (n=12, 23%), ANS (n=8, 14%), ADR (n=8, 14%) and CVS (n=9, 17%). Rapid fire (n=21, 38%), Scientists (n=13, 24%), jigsaw puzzle (n=7, 13%) and CNS (n=8, 14%) were the toughest rounds according to the students. 63% (n=34) of the students felt quiz preparation and participation will be helpful for viva, 4% (n=2) for practical, 13% (n=7) for theory examinations. Students preferred clinical case based learning (n=17, 31%), projects (n=12, 23%) and quiz (n=13, 24 %) as the

active teaching methods over the PowerPoint lectures and seminars.

4. Discussion

Quiz can be a fun and novel way to reconnect with the curricular material and are viewed by favorably by the teachers and also administrators and policy makers.⁶ In our study, students' had a positive attitude towards the quiz and felt that quiz is interesting, breaks the monotony, allows for team work and also improves interaction with the teachers. Feedback of the students was encouraging, majority of them found the rounds included and questions asked interesting, quiz improved peer interaction and co-ordination and also agreed that preparation and participation in the quiz helps for exam preparation especially for facing the viva voce. Innovative and out of the routine curricular rounds like Crosswords, rapid fire, ADRs identification, Toxiplay were favorites among the students. Such details add color and help to create complete picture and motivate for further learning.^{6,7} Well-organized subject oriented quizzes are known to improve learning, retention of information and recall.^{5,8} Viva voce forms an important aspect of medical exams, requires a different pattern of preparation along with ability to answer/ communicate within a given time. Regular exposure to quiz can improve spontaneous communication in students which can be helpful to face the viva.^{9,10}

Subject-wise quizzes have been evaluated in various clinical, pre and Para clinical subjects. A study done by Grover S et al evaluated the effectiveness of various Peer assisted learning methods as a part of MIBA such as Case based learning, power-point presentations (PPT), role-play, props, quiz etc. Quiz sessions followed by PPTs seminars and props received the highest mean scores, maximum participation was seen in role plays and quiz.¹¹ Another study done by Devi K et al used quiz as an innovative approach in teaching community medicine, results showed that quiz facilitated active learning, participation and increased awareness and interest in the subject.¹² Verma M et al assessed the attitude of students towards pediatrics quiz, students had a positive attitude and quiz increased awareness of the subject and allowed study in a different perspective.⁴ All the above studies re-inforce the findings of the present study.

Quiz participation also challenges the students in various aspects such as performing under stress in front of audience, in a given time frame, fear of failing in front of peers and teachers. Some debate that competition in education increases anxiety, but research shows that optimal competition in education allows students to address personal knowledge gaps and also performing under stress help in character building under pressure in front of audience.^{7,8} Healthy competition challenges the students to give their best, improve social interaction, co-operation, cultural diversity and negotiation.¹³

Table 3: Questionnaire for assessment of attitude of the students towards pharmacology quiz:

S.No.	Statements*	Strongly agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly disagree n (%)
1.	Quiz makes the subject interesting	39 (72)	14 (26)	1 (2)	0	0
2.	Quiz provides an opportunity for healthy competition and team work	35 (64)	16 (30)	3 (6)	0	0
3.	Breaks the routine monotony and is refreshing way of learning	33 (61)	15 (27)	5 (10)	0	1(2)
4.	I enjoy participating in the quiz and look forward to more such opportunities	36 (67)	11 (20)	7 (13)	0	0
5.	Participation and learning is more important to me than winning prize	39 (72)	12 (22)	3 (6)	0	0
6.	I would rather be an audience than a participant in the quiz	3 (6)	5 (9)	15 (27)	13 (24)	18 (34)
7.	Preparation for quiz can be useful for final exams	31 (57)	15 (27)	8 (14)	0	0
8.	Quiz participation is time consuming and not useful for me	0	4 (7)	5 (10)	18 (33)	27 (50)
9.	I would prefer reading for exams over participation in quiz	1 (2)	5(10)	11 (21)	22 (40)	15 (27)
10.	Quiz helps for better teacher-student interaction	31 (57)	20 (37)	3 (6)	0	0

*Scoring of the responses for positive statements (statements 1-5, 7,10): Strongly agree:5, agree:4, Neutral:3, disagree:2, strongly disagree:1
Scoring of the responses for negative statements (statements 6,8,9): Strongly agree:1, agree: 2 Neutral:3, disagree:4, strongly disagree:5

Table 4: Shows the mean attitude scores of the students for each statement.

S.No.	Statements	Mean score*	Grading of the attitude
1.	Quiz makes the subject interesting	4.71±0.48	Positive
2.	Quiz provides an opportunity for healthy competition and team work	4.58±0.60	Positive
3.	Breaks the routine monotony and is refreshing way of learning	4.47±0.79	Positive
4.	I enjoy participating in the quiz and look forward to more such opportunities	4.54±0.72	Positive
5.	Participation and learning is more important to me than winning prize	4.67±0.58	Positive
6.	I would rather be an audience than a participant in the quiz	3.73±1.19	Positive
7.	Preparation for quiz can be useful for final exams	4.4±0.78	Positive
8.	Quiz participation is time consuming and not useful for me	4.25±0.91	Positive
9.	I would prefer reading for exams over participation in quiz	3.81±0.99	Positive
10.	Quiz helps for better teacher-student interaction	4.48±0.69	Positive

* Grading of the mean score: <3: negative; 3: Neutral; >3: positive

The shift from a knowledge-based learning to competency based learning calls for curriculum reforms that emphasize all aspects of competencies: knowledge, skills and attitude.¹⁴ Demonstration of these competencies in non-clinical fields can be challenging.¹⁵ As evident from the results in this study, quiz can be an effective and feasible option to build and assess these competencies. Along with acquisition, applicability of these competencies into actual clinical practice is also vital. Active teaching-learning methods do impact on physician competency after graduation as well (coping with uncertainty, communication skills and self-directed learning).¹⁶ Hence competencies attained is a progressive, developmental, ongoing process, sustained efforts are needed at all levels of medical

education both by the faculty and students.¹⁷

Further different patterns of quiz are being tried and tested such as weekly computer based quiz,¹⁸ power point timed quiz,¹⁹ subject specific online quiz,⁸ formative quiz,²⁰ online chapter wise quiz²¹ etc. which have a positive impact on learning and academic improvement. Such patterns can refine the usage and effectiveness of quiz.

5. Conclusion

In this study, students had a positive attitude towards the quiz, students' responses indicate that quiz was interesting, allowed for healthy competition, team work, improved student-teacher interaction, and they look forward to more

Table 5: Feedback after the pharmacology quiz in our department

S.No.	Statements	Strongly agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly disagree n (%)
1.	Rounds in the quiz and questions asked were interesting	31 (57)	21 (38)	2 (4)	0	0
2.	Questions asked were tough	4 (7)	13 (24)	32 (59)	3 (6)	2 (4)
3.	Time allotted for various rounds was satisfactory	6 (11)	28 (52)	11 (20)	7 (13)	2 (4)
4.	Fair chance was given to all the groups for participation and answering	18 (33)	27 (50)	4 (7)	2 (4)	3 (6)
5.	Preparation and participation in the quiz will be useful for my examinations	30 (55)	22 (40)	2 (4)	0	0
6.	Improved peer interaction and co-ordination	32 (59)	18 (33)	3 (6)	1 (2)	0
7.	Prize given was satisfactory	27 (50)	18 (33)	5 (9)	2 (4)	2 (4)
8.	Overall organization and execution of the quiz was satisfactory	36 (67)	16 (30)	2 (4)	0	0

Table 6: Feedback after the pharmacology quiz in our department

Parameters	n (%)	Parameters	n (%)
1. Favorite round in the quiz		2. Toughest round in the quiz	
Crossword	21 (38)	Rapid fire	21 (38)
Rapid fire	10 (21)	Scientists	13 (24)
ADRs	9 (16)	Jigsaw puzzle (Medicinal plants)	7 (13)
Toxiplay	5 (9)	CNS	8 (14)
Jigsaw puzzle	5 (9)	Chemotherapy	5 (10)
Others	4 (7)		
3. Easiest round in the quiz		4. According to you Quiz preparation and participation would help you for which aspect of your examinations	
Crossword	17 (31)	Viva	34 (63)
General pharmacology	12 (23)	Practical	2 (4)
ANS	8 (14)	Theory	7 (13)
CVS	9 (17)	Practical and viva	4 (7)
ADR	8 (14)	Theory and viva	3 (6)
		Theory, practical and viva	4 (7)
5. Which method of learning according to you would be most useful to learn pharmacology			
PPT/didactic lectures	9 (16)		
Seminars	3 (6)		
Project based learning	12 (23)		
Quiz	13 (24)		
Clinical case based learning	17 (31)		

such opportunities. Crossword, rapid fire, identification of ADRs and jigsaw puzzle were the favorite and interesting rounds for the students. Students also felt that quiz will be helpful for preparation of exams especially viva voce. Quiz can also improve peer interaction, decision making, working under pressure and effective communication, regular quiz exercises and assessments can be an effective competency based learning tool for medical undergraduates.

6. Source of Funding

None.

7. Conflicts of Interest

No conflicts of interest.

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