

“Quiz – An Innovative Method Of Teaching Microbiology To Medical Undergraduate Students”

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Abstracts: Background & Objective: Many undergraduate medical students prefer to concentrate on clinical subjects and tend to neglect paraclinical subjects like Microbiology. A time has come when motivation is mandatory for the current generation of students. The present study attempts to introduce quiz as an innovative learning method. A quiz is a quick way of gathering information on how well our students are meeting their learning objectives. The present study is aimed to assess the students' knowledge and interest in Microbiology subject. Methodology: The present study was conducted in the department of Microbiology, D.Y. Patil medical college, Kolhapur, on second MBBS students. Five teams were enrolled from the neighboring medical colleges. We assessed the students' knowledge by giving pre and post MCQ tests followed by various rounds of quiz competition. Results: There was a significant increase in students' knowledge in post MCQ test than that of pre MCQ test ($P < 0.0001$). It was also observed that all the students had developed interest in Microbiology subject. Conclusion: We observed from the present study that even a simple intervention like quiz can make a significant improvement in the knowledge of medical students and help them to develop interest in microbiology subject. [Chougale R NJIRM 2016; 7(3): 101 - 106]

Key Words: Quiz, Multiple choice questions (MCQs), Knowledge, Microbiology.

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Introduction: Some things should never go out of style. In the midst of a galaxy of new teaching/ learning methods used in Medical Education Technology, there is still a scope for an amazingly basic tool, “Quiz” which has been underused in the medical field in the negotiation pedagogy^{1,2}.

By ‘quiz’, we are referring to an assessment tool with the following characteristics:

1. Specific questions are asked, specific answers are required; either in a word or in a couple of sentences.
2. The correct answers are pre-determined, not affected by students' opinionating or reasoning.
3. The exercise is conducted in a controlled, monitored framework (a classroom or an online quiz area), usually within a short time limit.

The answers reflect the students' understanding, ability to recall, as well as the ability to apply a concept learnt in the class. Fairness is implemented in the objective nature of the quiz, i.e students do not feel that they are being judged by a different measure than that of any other student. Students can display their knowledge by overcoming certain difficulties faced by them by a paper assignment for eg. language skills, paper anxiety, viva anxiety, word limitations etc. After the quiz, students gain knowledge by learning the correct answers to any questions they missed, can

highlight the areas requiring improvement or reconsider their study habits¹.

Learning is a complicated phenomenon which involves complex mental activities such as critical thinking and ability to solve problems³. Education and competition are two universal ingredients of all human cultures and are intimately related. In fact, competition is found so important, that a society specifically educates their young to compete⁴. Today's student is burdened and confused with a lot of information available on the internet and tremendous academic load.

Moreover, a medical student has to face competitions at various levels⁵. In a medical school, most of the teaching/ learning activities are in the form of didactic lectures and some small group sessions (passive learning). In order to maintain the interest and focus of students, there is a need to introduce new teaching and learning activities. Implementing innovative educational methods that enhance and supplement lectures is a challenge to medical educators⁶. According to the Medical Council of India, under Regulations on medical education, 1997, there is a scope for trying innovative approaches⁷.

Lectures alone are not an adequate method of teaching and are even less effective at skill development and in generating the appropriate attitudes⁸. Learning is a life-long process in the

medical field. New, innovative teaching/ learning strategies can ensure that tomorrow's medical students receive the need-based all round education. Many studies have shown that students actively learn by observing, performing activities and self-exploration^{5,9}. The student should be made to apply the concepts rather than just remember some information.

Among the several methods of teaching / learning, quizzes are considered one of the most effective^{5,10,11,12}. However, the incorporation of healthy, competitive elements like quiz is clearly lagging behind in the medical education. A good, healthy competition intended to enhance education should challenge the students to give their best. Social interaction, cooperation, team work, cultural diversity and negotiation are important aspects of human life. Competitions can force students to deal with many such fundamental values⁴.

Moreover, Microbiology appears to be the least favourite subject among the second MBBS students and is addressed negatively by them^{13,14}. Hence, in the present study, quiz competition was conducted as an innovative method of teaching to increase the students' knowledge and awareness of Microbiology with a special focus on its applied aspects and to promote student interaction.

Material and Methods: The present descriptive, and mixed (qualitative and quantitative) type of study, was conducted by department of Microbiology, in D.Y. Patil Medical College, Kolhapur during the month of August 2014. The present study was approved by the institutional ethical committee.

After the ethical committee clearance, the topic for the quiz competition, its rounds and all the questionnaires were discussed and validated by the departmental faculty. This quiz competition was conducted as a part of 'SMART' programme, i.e., 'SECOND MBBS ALLIANCE FOR RESEARCH AND TRAINING'.

The topic for the quiz competition was based on 'must know' area of Microbiology syllabus for second MBBS. The topic and schedule was announced one month before holding the quiz competition, to all included medical colleges. Totally there were 20 students who were representatives for five different medical colleges

from Maharashtra; namely D.Y. Patil Medical College, Kolhapur; Krishna Institute of Medical Sciences, Karad; Bharati Vidyapeeth Deemed University, Sangli; Rajarshi Chatrapati Shahu Medical College, Kolhapur and Government Medical College, Miraj. Each team consisted of four students. Lucky draw was made and teams were allotted alphabets as A to E seats. The rest of the second MBBS students formed the audience. Few of the second MBBS teaching staff members from the five different colleges also attended the quiz competition.

To evaluate students' performance, MCQ test was conducted before the quiz competition (Pre-test) by administering a set of five MCQs. Each question carried one mark and total time allotted was five minutes. The performance of the individual student was assessed by the marks obtained in pre-test and same set of MCQs was repeated in post-test.

There were five rounds in the quiz: MTFI (Multiple True False Independent); MCQs (Multiple Choice Questions); Visual, Case scenario and Rapid Fire Round. The details of contents of each round, time allotment, total questions per team and marks per question, negative marks, bonus marks if any and passing of the question is mentioned in Table-1. Marking system was given depending upon the type of rounds. The decision of the judges was final in deciding the correct answer and awarding the marks. Cumulative scores of all the rounds were considered in deciding the winning team.

After the competition, a suitable prize was given to the winning team and audience if the passed question was answered correctly.

A pre-validated questionnaire based on 5-point Likert scale was given to all participants for their feedback. This was followed by a class discussion between students and faculty.

Statistical analysis: Data analysis was carried out using students paired and unpaired 't'-test. P value < 0.05 was considered as significant.

Results: The present study shows participants' feedback using 5 point Likert's scale. All the 20 participants (100%) were motivated, enjoyed the quiz and developed interest in Microbiology subject. 18 (90%) participants agreed that the quiz competition

made them develop a good relation with their colleagues (Table 2).

Evaluation of student’s knowledge by using pre-test and post-test MCQs was carried out Table 3. In the pre-test, 8 students (40%) scored between 0-20% marks. 9 students (45%) scored between 21- 40% marks and 3 of them (15%) scored between 41- 60% marks. In the post test evaluation, 5 students (25%) scored between 61 to 80 % marks. 15 students (75%)

scored between 81- 100% marks. None of the students scored less than 60% marks. Furthermore, significantly increased knowledge ($P < 0.0001$) was noted in the post- test than that of pre- test score (Chart-1). When performance scores were observed in different teams, the highest performance was found in the visual round (60%). On the other hand, minimum performance score (8.33%) was observed in analytical thinking ability (case scenario round) [Table 4].

Table 1: Details of contents of each round

Rounds	Time (Sec/question)	Total questions per team & marks per question	Maximum marks	Negative marks	Bonus & passing the question
Round 1: MTFI (Multiple True False Independent)	30	3 questions with 5 options. 10 marks / correct response	150	No	No
Round 2: MCQ (Single Best Response)	5	5 questions. 20 marks / question	100	Yes	Passing allowed
Round 3: Visual	20	2 Visuals. 2 questions/ visual. 20 marks/ question	80	Yes	Passing allowed
Round 4: Case scenario	20	2 cases. 2 questions/case. 30 marks/ question.	120	Yes	Extra 40 marks for bonus question
Round 5: Rapid Fire	Immediate	Up to 5 questions	50	No	No

Table 2: Participants feedback in percentage

Questionnaire	Strongly agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)
Q1. Has the quiz motivated you?	100	-	-	-	-
Q2. Did you enjoy the quiz?	80	20	-	-	-
Q3. Did the quiz provide an environment for group learning?	100	-	-	-	-
Q4. Did the competition make you develop good relation with your colleague?	70	20	10	-	-
Q5. Did the quiz make you understand and comprehend Microbiology subject better?	90	10	-	-	-
Q6. Any comments and suggestions?					

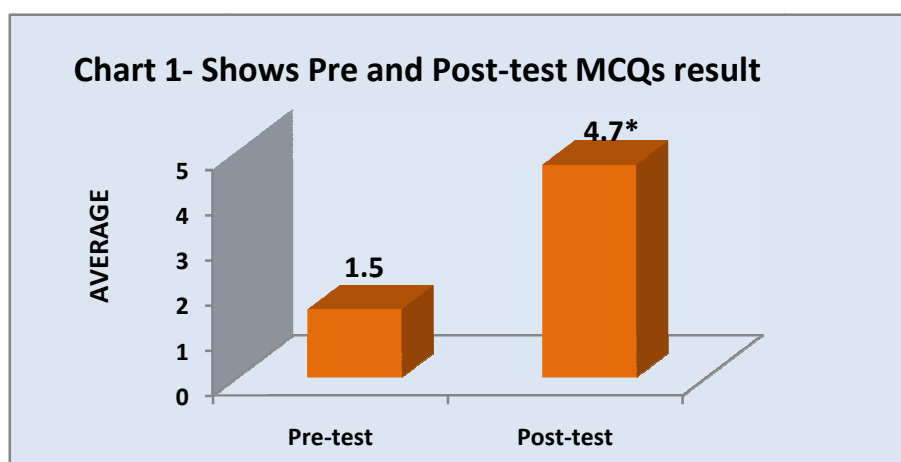
Table 3: Shows the evaluation of students knowledge by pre-test and post-test marks

Pre-test scores range (%)	No of students (%)	Post-test scores range	No of students
0-20	8 (40%)	0-20	-
21-40	9 (45%)	21-40	-
41-60	3 (15%)	41-60	-
61-80	-	61-80	5 (25%)
81-100	-	81-100	15 (75%)

*Students' scores are expressed in percentages (%)

Table 4: Performance scores of different teams

Rounds	Maximum marks	Team A	Team B	Team C	Team D	Team E	Mean	Percentage (%)
1.MTFI	150	110	100	85	60	90	89.5	59%
2.MCQ	100	70	60	50	60	40	56	56%
3.VISUAL	80	60	70	50	50	10	48	60%
4.CASE SCENARIO	120	20	20	10	0	0	10	8.33%
5.RAPID FIRE	50	30	10	10	0	0	10	20%
TOTAL	500	290	260	205	170	140		



Results are expressed in Mean±S.D. P value <0.05 considered as significant

*= P value Highly significant (P<0.0001)

Discussion: Today's world is a paradigm shift towards competence. Competence means being in a state of readiness at all times. Success in this competent world depends on one's ability to move ahead, the confidence and the skills one possesses. In this exciting context, where there are numerous doors of opportunity, competitive education has assumed greater significance.

Medical teachers stretch their extent of information and knowledge in a logical, planned, integrated and sequential manner to the students through different approaches¹⁵. Innovative methods like problem based learning (PBL), quiz, educational films, small group discussions, case based learning (CBL) and project based learning are being introduced based on the above concept^{3, 5, 16, 17}. The importance of quiz in teaching & learning has been evaluated in a variety of medical disciplines^{2, 3, 10, 11, 18, 19, 20}.

However, there are very few reports of implementing quiz as a method of teaching/ learning Microbiology for undergraduate medical students.

In the current study, the feedback from participants was obtained in the form of open ended questions and one close ended question. It was noted that all the participating students were motivated, enjoyed the quiz and developed interest in the subject. Similar findings were reported by other authors^{2, 5, 10, 20, 21, 22}. Maximum students agreed that they developed good relations with other colleagues and also said that the quiz provided an environment of group learning. Medical students, after completion of studies take up jobs which require team work with consultants from various disciplines, nurses, physiotherapists, dieticians, etc for efficient patient care. Cooperative learning helps students to develop skills required to work in teams²³. On analyzing the open ended feedback question, we found some interesting comments : the

students were encouraged to study more intensively. It increased their analytical and critical thinking skill. It generated interest in several topics that they might have otherwise ignored. They had a wonderful opportunity to interact with teachers as well as with each other and develop new friends and ideas. It boosted their confidence and helped them to become more bold and challenging. The students could assess their level of knowledge and intellectual status in relation to other students of the same college as well as different medical colleges. They also suggested conducting quizzes more frequently and clinically oriented classes.

Our findings are only preliminary with a small sample size. Extended studies with additional participants need to be conducted to increase the overall strength of our findings.

Increase in knowledge was observed significantly ($P < 0.0001$) in the post- test than that of pre- test scores (Chart 1). By applying collaborative and cooperative theories, group quizzes serve as an effective means of imparting and improving knowledge. Research in cognitive psychology has shown that testing of knowledge can directly affect learning by providing better retention of information, a phenomenon known as 'testing effect'²⁴. Our results are in agreement with other studies^{10, 12, 20}.

It was noted that the students' performance was highest in the visual round than that of other rounds. This may be because of students' greater interest in referring to other sources like internet images for the preparation. Similar findings were noted by other coworker³. On the other hand, lowest performance was observed in analytical thinking ability (case scenario round). The decreased score in clinical thinking ability may be because conventionally, undergraduate students are taught in didactic lectures, practical exercises and tutorials, which are mainly passive teaching and learning methods and do not develop analytical thinking skills or reasoning skills of the students. Furthermore, there is hardly any involvement of students in the teaching/ learning process (Active learning)²⁵.

Thus, since the learning experience consisted of a quiz followed by class discussion, this quiz was beneficial both to the students as well as the teachers. It also served as an additional option for teaching / learning methods acceptable to students²⁶. To evaluate the

students' learning optimally, new teaching strategies should be scientifically upgraded through questionnaire, students' comments and evaluation of assessment outcome³. On identifying the deficiencies of teaching curriculum, we can implement reinforcement by different methods, which is the principle of value- aided adult learning²⁷.

Effective teaching involves consistent valuable interactions with students, to guide them and boost their confidence. The quiz method increases self confidence, knowledge and interest of the students. It stimulates interactive learning and strengthens the relationship between faculty and students of different medical colleges. It facilitates academic growth with a competitive spirit. Academic competition is a motivating force. Team- based competition can make academic material more interesting and entertaining to students⁵. We can quickly gather information on how well our students are meeting their learning objectives, as well as assess our own teaching accomplishments.

Conclusion: From the present study, we observed that even a simple intervention like quiz can make a significant improvement in the knowledge of medical students and help them to develop interest in microbiology subject. Students wanted more of clinically oriented classes and quizzes. They advocated the use of audiovisual aids and more frequent use of computer and internet. Hence we think that we can implement a clinically oriented curriculum with refresher courses in computer applications and internet use. This can make the teaching learning process in the medical sciences more effective and relevant to the health of the society.

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