

## MCQ Supplementation in a Physiology Didactic Class: A Learning Tool

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**Abstracts: Background and Objectives:** Medical educators are facing the challenge to develop innovative creative material so as to engage the students in active learning, more so for basic sciences. In addition the innovations should help student learning, keeping time and manpower and economy constraints in mind. Overall objective of this study was to study and assess the role of MCQ supplementation in a didactic class in improving student learning. **Methods:** 136 First year MBBS students of a government medical college attending physiology classes were recruited for the study. Based on the university recognized syllabus the Specific learning objectives (SLOs) were randomly grouped into two categories, that is, SLOs for which didactic classes were to be supplemented with multiple choice questions (MCQs) and those SLOs for which didactic classes were to be taught without MCQ supplementation. **Results:** On subjecting individual student's scores obtained in the two categories of MCQs to unpaired 't' test the difference was found to be statistically significant,  $p = 0.025$ ,  $t = 2.259$ . 95% CI. **Conclusion:** Reinforcement of Didactic class with MCQ supplementation is an effective learning tool which was well received by the participants. [Bhatt M NJIRM 2015; 6(1):72-76]

**Key Words:** Didactic class, learning tool, multiple choice questions, MCQ, specific learning objectives

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**Introduction:** Learning process rests on the strong framework provided by a combination of sensory stimulus, re-enforcement and facilitation. There is a paradigm shift taking place, medical education is becoming and expected to be learner centric than teacher centric. Teachers can no more be complacent with having managed to finish with a lecture or the assigned syllabus. Their teaching is being judged and monitored by learner outcomes. Therefore there arises a need to bring about productive innovation to facilitate student learning. We are all well versed by the challenges posed by didactic lectures i.e. passive participation, non-interactive, poor learning, monotonous etc. Many interventions, innovations have been explored by researchers to make classrooms more interactive and induce active learning. Educators have explored the use of problem based learning<sup>1</sup>, embedded animations with didactic classes<sup>2</sup>, unsupervised online quizzes<sup>3</sup>, audiovisual aids<sup>4</sup>, intra group tutorials<sup>5</sup>. The present study endeavours to assess the role of supplementation of a didactic class with MCQ in student learning.

A study by Larsen et. al.<sup>6</sup> concluded that repeated testing with feedback improves long term retention relative to repeated spaced study, therefore testing should not be seen or used only as an assessment tool but also as a learning tool. MCQs are currently being used as an assessment

tool in summative assessments, entrance exams, screening exams etc. Gupta<sup>7</sup> and colleagues have explored the strategic use of MCQs in formative assessment and got encouraging results wherein 60% students agreed that MCQ testing improved their learning. Palmer et. al.<sup>8</sup> explored to study the role of constructing MCQs as a learning strategy but found it to be an unpopular learning strategy, less stimulating than traditional learning methods.

They also did not find any significant difference in learning outcomes between MCQ constructing group and their control group. Kalludi and coworkers<sup>9</sup> in their study on dental students found use of podcasts to be well perceived, effective, acceptable method especially for revisions just before exams. Larsen and colleagues<sup>10</sup> compared the effects of test enhanced learning and learning through self-explanation. They found both methods to be effective for learning but repeated testing led to better long term retention and application than repeatedly studying the material or self-explanation. Researchers<sup>11</sup> have found MCQ testing in anatomy to improve learner outcomes assessed through MCQ based common test for the study and control group. As far as our literature search goes we could not find any study where MCQ supplementation in a didactic class is being explored as a learning tool.

Reinforcement in the form of online spaced education programs was used by Gyorki et. al.<sup>12</sup> and got overwhelming results. 92% of the participants agreed that this online spaced education initiative increases knowledge retention following a face to face workshop. Dobson<sup>13</sup> in a retrospective analysis of the data concluded that students who had undertaken online quizzes had higher mean scores in summative exams. The study also found significant positive correlation between individual's mean exam score and individual's mean online quiz score. Kibble et.al.<sup>3</sup> also used online quizzes in formative assessment to improve learning and found that participants who undertook online quizzes performed better in summative exams. Jobs et. al.<sup>14</sup> did not find improvement in learning by constructing questions .

**Material and Methods: Participants:** First year MBBS students of a Govt medical college attending physiology classes were recruited. The Approval of the Institutional Ethics Committee for exemption was obtained.

**Specific learning objectives:** Based on the university recognized syllabus (must know) a list of specific learning objectives (SLOs) in a specific system (Blood) was prepared . The SLOs were grouped into two categories i.e. SLOs which were to be supplemented with MCQs and those SLOs which were to be taken without being supplemented by MCQ.

**MCQs:** MCQs were prepared. The hand-outs of the MCQs without the answer key were handed out to students 2-3 days in advance to find the solution along with its justification, discuss amongst their colleagues, refer to the books in their leisure hours. Once the didactic class for the specific SLO was over , the MCQ hand-outs were discussed in the class with maximum participation from the students. Since the MCQs were designed in a way where more than one choice could be correct, this required defending every option and discussion on the choices given in the MCQs.

**Feedback Questionnaire:** Feedback on this exercise was obtained from students using self-

administered questionnaire (appendix A). The data gathered from the questionnaire was analyzed .

**Formative test scores:** At the end of the study a formative test was conducted based on specific learning objectives supplemented with and without MCQs. The scores obtained in the two categories were compared and analysed

**Statistical analysis:** Unpaired t-test was applied to analyze the scores of the two categories

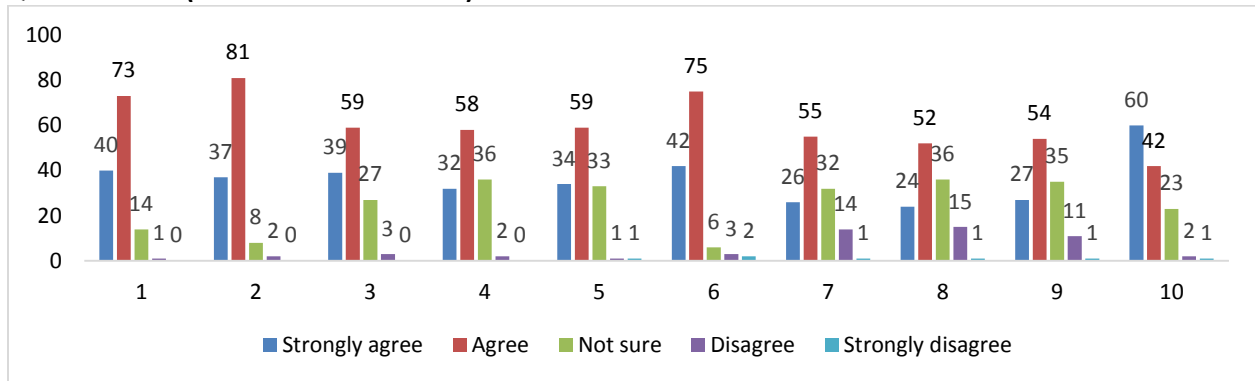
**Results:** A total of 136 students were admitted in first year MBBS course. Since this was an educational innovation project being conducted during their routine teaching hours, hence all the students were recruited for the study. The project extended over a period of one month. Due to sickness, domestic issues, absent without definitive reason etc. a total 39 students absented themselves on one or more than one occasion. Hence the scores of MCQ test of absentees (during the study period) had to be excluded from data analysis of score obtained in the MCQ based formative test i.e. only scores of 97 students were subjected to statistical analysis . Scores obtained in a formative test consisting of 20 MCQs (10 from topics reinforced with MCQs and 10 from topics without reinforcement with MCQs) of 1 mark each was analysed (maximum score = 10 in each category). Mean score obtained in MCQs for the SLOs that were reinforced with MCQ was  $7.18 \pm 1.55$ . Mean score obtained in MCQs for the SLOs that were not reinforced with MCQ was  $6.68 \pm 1.56$ . Mean scores when subjected to unpaired t test did not show statistically significant difference  $p = 0.657$ ;  $t = 0.452$ . But the individual scores in the two categories of MCQs showed a statistically significant difference;  $p = 0.025$ ;  $t = 2.259$ ; 95% CI. Higher scores were found in the SLOs with MCQ supplementation compared with SLOs without MCQ supplementation.

128/136(94%) students returned the duly filled up feedback forms and were considered for the data analysis of feedback questionnaire that consisted of total of 13 items (appendix A). Figure 1 and 2 shows feedback responses obtained from students in the form of the bar diagram. This comprises of responses obtained from students for close ended

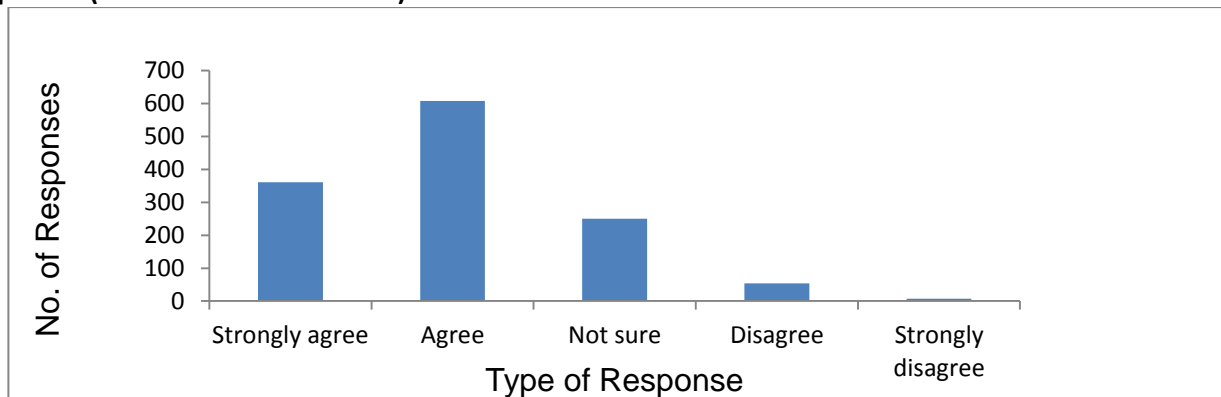
questions i.e. Item1 to 10. 92% (118/128) agreed or strongly agreed that this method improved their understanding. 88% (113/128) agreed that this methodology helped them in their learning. 91% (117/128) found this method to be interesting. 80% (102/128) agreed or strongly agreed that this method should be used for other topicsalso. Figure 3 and 4 shows feedback responses for open ended questions i.e. Item 11 to 13. 98% (126/128)

participants responded to Item 11. 70% (88/126) of the students liked the methodology as it helped them in better understanding the topic, found it interactive or liked the discussion part. 71% (63/89) responders to item 13 suggested increasing number of MCQs or MCQ assisted method to be used for all the topics.

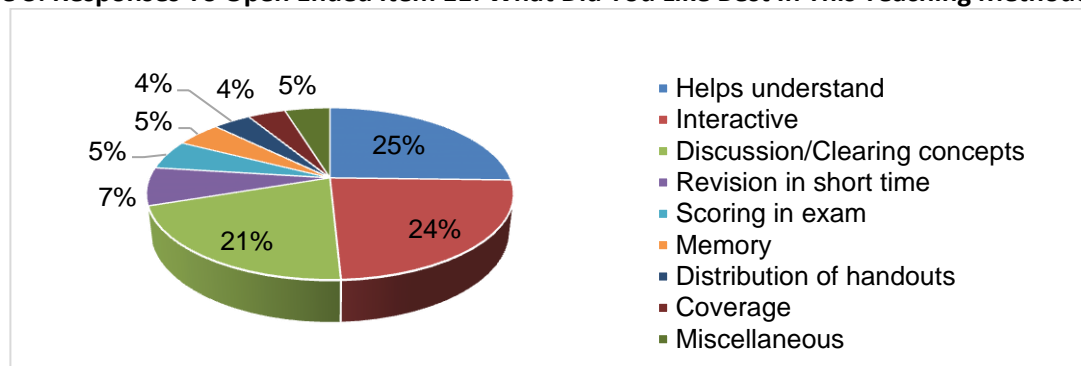
**Figure 1: Item Wise Frequency And Type Of Response Obtained Against Each Question Of The Feedback Questionnaire (Close Ended Item 1-10).**



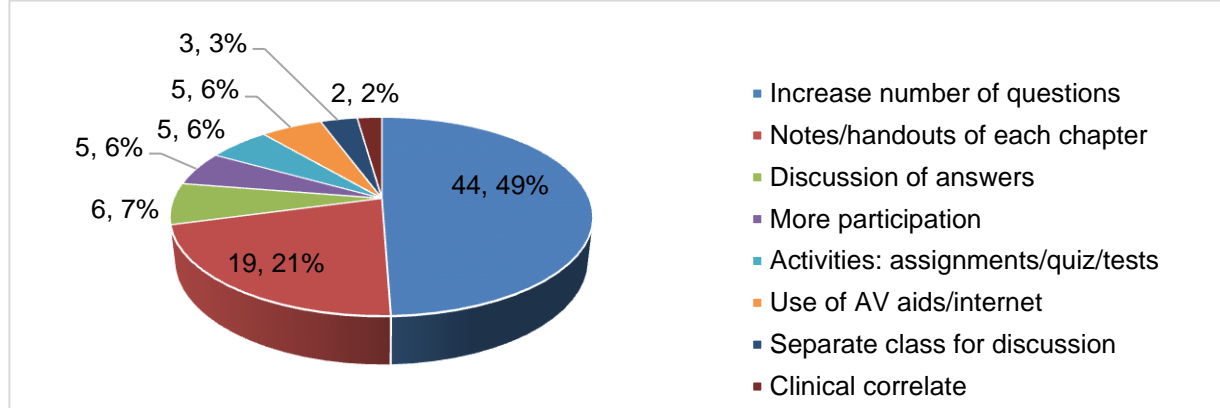
**Figure 2: Category Wise (Strongly Agree, Agree, Not Sure, Disagree, and Strongly Disagree) Frequency Of Responses (Close Ended Item1 To 10).**



**Figure 3: Responses To Open Ended Item 11: What Did You Like Best In This Teaching Methodology?**



**Figure 4: Responses to Open Ended Item 13: In What Way Could This Teaching Methodology Be Improved In Numbers and %?**



**Discussion:** To our knowledge most of the studies that have been done in the past have focused on the use of MCQs as an assessment tool. Gupta et.al.<sup>7</sup> used MCQs as a learning tool and concluded MCQ as a valuable tool based on student feedback only. Palmer and Devitt<sup>8</sup> studied construction of MCQ as a learning tool on fourth year medical students (who to some extent could be expected to construct MCQs) but the feedback from students was not encouraging. Our students were first term medical students; hence construction of MCQs by these students was not studied.

In our methodology SLOs with MCQ supplementation and SLOs without MCQ supplementation formed the two groups. Thus all the students were exposed to similar teaching – learning methodology. Scores of students in a MCQ based Test on these groups of SLOs was then subjected to statistical analysis. Also responses obtained from student feedback on this methodology were analysed. Individual student's performance in the MCQ assisted SLOs was found to be better than non MCQ assisted SLOs.

Students were given handouts in advance so as to encourage them to come prepared before each class and the class time could then be used for discussion and immediate feedback on every MCQ. Our strategy of giving handouts in advance is similar to Dobson's<sup>13</sup> methodology wherein they had opened lines for online quizzes 48hrs (timed quizzes) prior to the related class. They found positive correlation between participant's scores in

online quizzes and in summative exams. Since we had not reinforced all the SLOs with MCQ therefore students in their feedback have suggested that this MCQ supplementation strategy should be used for all the topics.

**Strengths and Limitations of the study:** This innovation was carried out during regular classes hence not limited by economic or time constraints, yet all the students were exposed to similar teaching learning methodology. The only limitation of the study appears to be unsupervised use of MCQ hand-outs in their leisure time. Hence one cannot be sure as to how many and to what extent students would have made use of the MCQ hand-outs. Most of the students did not like the fact that all topics were not discussed with MCQ, or were not given MCQ hand-outs for all the topics. One of the positive suggestions in the feedback form has been that all topics should be reinforced with MCQs

**Conclusion:** Reinforcement of Didactic class with MCQ Supplementation is an effective learning tool which is being under-utilized as a learning tool. Use of MCQs should not remain restricted to only as an objective assessment tool. It is a strategy well received by the students.

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