

## Effectiveness of MCQ, SAQ and MEQ in assessing cognitive domain among high and low achievers

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### ABSTRACT

**Background:** The method chosen for important examinations strongly influences the nature of student learning. Multiple choice question (MCQ), Short answer question (SAQ) and Modified essay question (MEQ) are the commonly used tools for assessing cognitive domain of undergraduate medical students.

**Objectives:** The present study is designed to examine the performance of high achievers and low achievers in order to find out the effectiveness of MCQ, SAQ and MEQ in assessing cognitive domain.

**Methods:** Results of forty students of second MBBS were examined to assess cognitive domain by giving MCQ, SAQ and MEQ of 25 marks each. Marks obtained were compared among twenty high achievers and twenty low achievers. Comparisons between different methods of assessment were done by paired t test.

**Results:** Average marks obtained by high achievers in MCQ, SAQ and MEQ were 15.65 (62.6%), 18.4 (73.6%) and 15.45 (61.6%) respectively while in low achievers scoring in MCQ, SAQ and MEQ were 10.8 (43.2%), 11.9 (47.6%) and 10.75 (43%) respectively. It suggests that maximum scoring was done in SAQ followed by MCQ and MEQ by high as well as low achievers. The (Mean  $\pm$  SD) marks obtained by high achievers in MCQ v/s MEQ was significant ( $p < 0.05$ ) whereas for SAQ v/s MEQ and MCQ v/s SAQ was highly significant ( $p < 0.005$ ). The (Mean  $\pm$  SD) marks obtained by low achievers in MCQ v/s MEQ, SAQ v/s MEQ and MCQ v/s SAQ was not significant ( $p > 0.05$ ).

**Conclusion:** High achievers as well as low achievers performed better in SAQ as compared to MCQ and MEQ. Instead of using single assessment tool multiple assessment tools should be used in definite proportion to assess the cognitive domain of undergraduate medical students.

**Key words:** assessment, cognitive domain, evaluation, modified essay question, multiple choice question, short answer question.

### INTRODUCTION

Assessment is a very important component of medical course curriculum. Medicine itself is a profession in which accurate and responsible assessment is of cardinal requirement. The assessment procedures have a powerful influence over learning process.<sup>1</sup> Scientific studies confirmed that it is the evaluation system rather than the educational objectives or curriculum or instructional techniques that have the most profound impact on what the students ultimately learn.<sup>2</sup> Multiple choice questions (MCQ), short answer questions (SAQ) and modified essay questions (MEQ) are the commonly used tools for assessing cognitive domain of undergraduate medical students.

MCQ have been used extensively in all kinds of examinations. It is a time tested method of assessment of knowledge in both undergraduate

and postgraduate medical education for the purpose of ranking in the order of merit.<sup>3-4</sup> SAQ involves writing short answers to short questions sampled from a large part of the curriculum.<sup>5</sup> SAQ carries greater objectivity and reliability and their range of subject areas tested is extended.<sup>6</sup>

The MEQ was developed by Hodgkin and Knox (1975)<sup>7</sup> for the examination of the Royal College of General Practitioners and has since been used to assess general practitioner trainees at various points in their training (Knox 1989).<sup>8</sup> It has been shown to be a reliable assessment tool and successfully adopted to evaluate the communications skills as well as the five levels of cognitive processing specified by Bloom of pre-clinical undergraduates.<sup>9-14</sup>

Because MEQ, SAQ, and MCQ examinations are not optimal ways of assessing students' performance, institutions using these assessment

methods cannot confidently claim to have achieved the objectives of the medical curriculum (i.e., to enable a student to solve patient problems).<sup>15,16</sup> because these methods can assess mainly the cognitive domain where as psychomotor and affective domains are difficult to be assessed by these three methods of assessment. Six assessment methods: (MEQ), (SAQ), (MCQ), patient clinical examination (PCE), problem-based oral examination (POE), and objective structured clinical examination (OSCE) for their abilities to test for students' performance has also been studied to find a Model for Selecting Assessment Methods for Evaluating undergraduate Medical Students.<sup>17</sup>

The findings of the study on summative assessment conducted in Bangladesh reveals that, there is an increase in understanding of specific type of questions in the new curriculum question papers. Along with this a decline in the amount of recall and non-specific type of questions are also observed, though the change was not significant. Again, increase in the amount of short answered questions (SAQ), decrease in short essay questions (SEQ) and absence of long essay questions in the ongoing curriculum in comparison to the older one has been observed.<sup>18</sup>

This study is designed to analyze the performance of high achievers and low achievers using MCQ, SAQ and MEQ as assessment tool so that comparison of three assessment methods among high achievers and low achievers can be made and to find out the effect of MEQ, SAQ & MEQ in assessing cognitive domain of high achievers and low achievers.

## MATERIALS AND METHODS

Twenty high achievers and twenty low achievers of M.B.B.S second professional students were selected for this study on the basis of their previous performance in first and second sessional examinations of MBBS II professional and I MBBS university examination. Students were informed about the topics to be assessed two weeks prior to the test. First question paper containing MCQs of

25 marks to be covered in 30 minutes were distributed. On completion, another question paper including MEQ(25 marks) and SAQ (25 marks) was given and time allotted for this paper was 60 minutes. Before performing the test, reliability and validity of all the questions were established by peer review.

Marks obtained from all the three types of questions were evaluated and the results were compared among high and low achievers. The comparison between different methods of assessment, with all six possible combinations, was done by paired 't' test.

## RESULTS AND DISCUSSION

Average marks obtained by high achievers in MCQ, SAQ and MEQ are 15.65 (62.6%), 18.4 (73.6%) and 15.45 (61.6%) and by low achievers as 10.8 (43.2%), 11.9 (47.6%) and 10.75 (43%) respectively. It suggests that maximum scoring was done by high achievers in SAQ followed by MCQ and MEQ.

**Table 1.** Marks obtained by high and low achievers.

Sr.No.	MCQ H	MCQ L	SAQ H	SAQ L	MEQ H	MEQ L
1.	17	8	18	13	13	12
2.	15	12	21	7	19	10
3.	20	11	16	11	16	11
4.	19	9	19	5	13	10
5.	16	12	19	18	13	13
6.	14	11	24	10	17	8
7.	17	10	20	7	17	11
8.	15	10	16	2	17	13
9.	16	13	21	15	21	11
10.	12	9	17	18	14	10
11.	13	16	16	13	16	11
12.	14	8	18	13	11	8
13.	10	13	18	2	17	13
14.	16	6	14	12	16	12
15.	21	14	22	13	11	10
16.	19	10	21	15	15	8
17.	15	12	19	21	18	12
18.	16	14	13	13	19	13
19.	10	10	17	21	13	9
20.	18	8	19	9	13	10
Average Marks	15.65	10.8	18.4	11.9	15.45	10.75
% of average marks	62.6%	43.2%	73.6%	47.6%	61.8%	43%

H = High Achiever L = Low achiever

**Table 2.** Outcome of Paired Samples test

Pair	Type of questions paired	Category	Paired Differences					t	P Value (df=19)	Significance
			Mean	Std. Deviation	Std. Error Mean	95% Confidence interval of the Difference				
						Lower	Upper			
Pair 1	MCQ vs MEQ	High achievers	.200	4.408	.986	-1.863	2.263	.203	< 0.05	significant
Pair 2	MCQ vs MEQ	Low achievers	.050	2.645	.591	-1.188	1.288	.085	> 0.05	Not significant
Pair 3	SAQ vs MEQ	High achievers	2.950	3.940	.881	1.106	4.794	3.348	< 0.005	Highly significant
Pair 4	SAQ vs MEQ	Low achievers	1.150	6.020	1.346	-1.667	3.967	.854	> 0.05	Not significant
Pair 5	MCQ vs SAQ	High achievers	-2.750	3.582	.801	-4.426	-1.074	-3.434	< 0.005	Highly significant
Pair 6	MCQ vs SAQ	Low achievers	-1.100	5.884	1.316	-3.854	1.654	-.836	> 0.05	Not significant

More or less similar pattern is reflected by low achievers. However, average marks obtained in MCQ, MEQ and SAQ is high in high achievers and low in low achievers.

Comparing performance of high achievers by MCQ vs MEQ methods and on calculating p value by paired t test, p value is < .05 (significant) whereas in low achievers it is > 0.05 (not significant). Statistically, it indicates that MCQ and MEQ can differentiate the cognitive domain among high achievers but not in low achievers. On comparing performance of high achievers by SAQ vs MEQ method and calculating p value by paired t test, p value is < .005 (highly significant) whereas in low achievers it is > 0.05 (not significant). Statistically, this indicates that SAQ and MEQ can differentiate the cognitive domain among high achievers but not in low achievers. The comparison of performance of high achievers by MCQ vs SAQ method and calculating p value by paired t test, p value is < .005 (highly significant) whereas in low achievers it is > 0.05 (not significant). Statistically, this indicates that SAQ and MEQ can differentiate the cognitive domain among high achievers but not in low achievers.

In our study we found that high achievers as well as low achievers performed better in SAQ as

compared to MCQ and MEQ. Keeping three different assessment tools i.e. MCQ, SAQ and MEQ gives broader coverage of the syllabus being evaluated. These three assessment tools also provide greater objectivity, reliability and validity to our assessment process. In our study we found that all the three assessment methods in definite proportion are a better method for assessing the cognitive domain of undergraduate medical students instead of using only one or two assessment tools.

## CONCLUSION

To assess the cognitive domain of undergraduate medical students and to cover the broad course it is imperative to use all the three assessment methods in definite proportion to offer greater variety. It is evident by the scoring pattern, which is almost similar in high and low achievers for these three methods of assessment.

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