ORIGINAL ARTICLE

Role of Faculty Development Workshop for Improving MCQS Quality in Basic Medical Sciences

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ABSTRACT

Background and Objective: Multiple-choice questions (MCQs) are a frequently used method of assessment in medical education. MCQs have to be well-constructed and have minimal flaws to achieve higher reliability and validity. Developing high quality MCQs is difficult but formal faculty training has found to have a positive impact on MCQ writing skills and quality. The purpose of the study was to assess the effect of a one-day training session on the quality of MCQs and the change in faculty's self-rating of their competency in MCQ construction.

Methods: This was a quasi-experimental study. A targeted workshop was conducted to train 17 faculty members in item writing skills and to improve the quality of existing item bank. Training was provided on the process of developing high quality assessment items and methods to avoid item flaws. Analysis of 48 MCQs from the existing MCQ bank was done for critique and improvement in quality. The MCQs were analyzed for level and type of questions and presence of item writing flaws. Faculty self-rating of their competency before and after the workshop session was also collected. Wilcoxon rank sum test was used to determine any change in the pre and post workshop quality of MCQs. Paired t-test was applied to analyze change in participants' perception of their competency before and after the workshop session.

Results: Analysis showed that after the workshop, the number of MCQs testing recall reduced significantly (N 42, 30, $P \leq 0.05$). Similarly, questions testing application of knowledge improved significantly (N 6, 17, $P \leq 0.05$). Analysis of faculty's self-rating of "change in competency" showed a significant improvement ($P = 0.00$) in their ability to improve the stem, lead-in and options list with appropriate and logically sequenced distractors.

Conclusion: Targeted faculty development workshops improve the quality of MCQs construction. These trainings should be well structured and conducted on regular basis for better outcome.

KEYWORDS: Multiple choice questions, Faculty development, Educational assessment, Workshops.

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INTRODUCTION

Multiple-choice questions (MCQs) are a preferred and frequently used method of assessment of cognitive domain in medical education. The MCQ format offers many advantages. A large number of students can be tested at one time and a broader

content area can be covered. Moreover, MCQs can assess students' higher cognitive skills like application, analysis and interpretation of knowledge. High quality MCQs have higher reliability and validity.[1] They can efficiently differentiate between high- and low-achievers. To achieve this MCQs have to be well-constructed and without flaws.Most common flaws are that which either benefit the student (flaws of test wiseness) or make it harder for students to attempt the item (flaws of irrelevant difficulty).[2,3] Various studies have analyzed MCQs created for student assessment in medical education and have found a number of item flaws.[4,5] Studies have shown that quality of student assessment improves if flawed items are revised.[6] Developing high quality flawless MCQ items is still a difficult task for faculty,[7] more so for those who have not received formal training.[2] Availability of standard guidelines is not sufficient to facilitate this process. This results in flawed items that usually fail to test the higher cognitive levels.[3]

Formal Faculty training has found to have a positive impact on MCQ writing skills and the quality of MCQs.[8,9] Faculty satisfactions with the training is another feature that is important for long term impact of the training.[10] Studies reported that usefulness, relevance and format of training sessions were important factors that influenced faculty satisfaction.[6,10]

Faculty development programs range from one day workshops to week long programs and longitudinal programs. The Department of Health Professions Education, Liaquat National Hospital and Medical College introduced a one-day faculty training session on MCQ development to help faculty improve their item writing skills, ability to identify flaws and rectify them. The purpose of this study was to assess the effect of this one-day training session on improvement in the quality of MCQs and to assess the change in faculty's self-rating of their competency in MCQ construction before and after the workshop.

METHODS

This was a quasi-experimental study conducted at Liaquat National Hospital and Medical College (LNH&MC) in November 2017. The institutional Research and Ethical Committee approved the study vide Letter No: ERC# 0389-2017 dated 31-10-2017. The participants were asked to fill a consent form before starting of the workshop and were assured of maintaining of confidentiality.

Before the session, 48 flawed questions of GIT and Liver module 1 were identified from the question bank through a checklist by two medical educationists of the Department of Health Professions Education. The checklist was based on NBME guidelines for the development of high quality test items. A targeted MCQs development workshop was conducted to train the LNH&MC basic science faculty involved in GIT & Liver-1 Module. Seventeen faculty members from the Department of Anatomy, Physiology, Biochemistry and Pharmacology participated in this workshop that included Professors, Associate and Assistant Professors. The same Medical Educationists facilitated this workshop. This was a five-hour workshop where, the first two hours were dedicated to the training of faculty on format and characteristics of high quality assessment items, pitfalls in writing questions, ways to improve an item to test higher order thinking and methods to avoid test-wise student's strategies.

In the next step, the faculty was grouped according to discipline and given flagged items from the identified 48 MCQs as per their specialty. A checklist of question characteristics and flaws was provided. Faculty was asked toreview, critique and make changes to improve the question quality based on the checklist provided. Ongoing feedback was given to the faculty.

The MCQs in the bank were analyzed for the following:

Area	Items Reviewed
Level of questions	- Recall/application of knowledge
Type of question	- One correct/one best - Grammatical errors
Issues related to test-wiseness	- Use of absolute terms - Logical cues - Long correct answers - All, except or none in the stem
Issues related to irrelevant difficulty	- All or none of the above in the stem - Heterogeneous options

At the conclusion of the workshop, the participants were given an anonymous questionnaire assessing the faculty on their competency before and after the workshop session (retrospective pre-post format) in the following areas: Identification of the objectives that need improvement, correlation of objectives with the question, application of the knowledge of item writing flaws to improve the stem, lead-in and the options list with appropriate distractors in a logical sequence.

STATISTICAL ANALYSIS

SPSS 20.0 was used for data analysis. The quality improvement of assessment items was analyzed by determining the percentage of item writing flaws in each item. The Shapiro-Wilk test determined that the distribution of data is not normal so Wilcoxon rank sum test was used to determine any change in the pre and post workshop quality of MCQs.

The data of feedback questionnaire was normally distributed so Paired t-test was applied to analyze change in participants' perception of their competency before and after the workshop session.

RESULTS

A total of 48 MCQs of GIT and Liver-I Module were selected for different flaws in the items. The flaws were then compared before and after the workshop under the headings categorized below. The comparison of result analyzed is given in Table-1.

Table-1: Analysis of the MCQs before and after the workshop.

		Before Workshop	*After Workshop*	*P-value*
Question Level	Recall	88% n = 42	64% n = 30	***0.005**
	Application of Knowledge	13% n = 6	36% n = 17	***0.008**
Question Type	One best	27% n = 13	43% n = 20	0.127
	One correct	73% n = 35	57% n = 27	0.074
Issues Related to Test-Wiseness	Grammatical errors	2% n = 1	2% n = 1	0.655
	Use of absolute terms	2% n = 1	0% n = 0	
	Long correct answer	0% n = 0	0% n = 0	
	Logical clues	10% n = 5	9% n = 4	
Issues Related to Irrelevant Difficulty	All/except/none in stem	0% n = 0	0% n = 0	0.317
	All/none of above	0% n = 0	0% n = 0	
	Heterogeneous options	17% n = 8	11% n = 5	

The analysis of 48-flawed MCQs showed that the number of questions testing recall decreased significantly from 88% to 64% (P≤0.05) after the workshop. Similarly, proportion of items testing application of knowledge improved significantly to 36% from 13% (P≤ 0.05). However question type, issues related to test-wiseness and irrelevant difficulties did not show any significant improvement (P>0.05).

Faculty self-rating

The perception of 17 faculty members on their competency in developing MCQ before and immediately after the workshop session was analyzed (Table-2). The results showed there is significant improvement (P = 0.00) in identification of objectives within the question, ability to improve lead-in, improve option list with appropriate logically sequenced distractors.

Table-2: Comparison of pre & post faculty self-rating.

Competencies	*Pre Test Session*	*Post Test Session*	*P-value*
I can identify the objectives that need to be rephrased or improved	2.7 ± 1.1	4.52 ± 0.624	*0.00
I am able to correlate objectives with the question	3.35 ± 1.2	4.52 ± 0.62	*0.00
I am able to apply the knowledge of item writing flaws while improving the stem	2.88 ± 1.31	4.29 ± 0.77	*0.00
I am able to apply the knowledge of item writing flaws while improving the lead-in	2.76 ± 1.34	4.17 ± 1.01	*0.00
I am able to improve the options list with appropriate distractors	2.76 ± 1.09	4.23 ± 0.66	*0.00
The options, I developed are logically sequenced	3.05 ± 0.966	4.23 ± 0.66	*0.00

*paired sample t test applied

DISCUSSION

The methods of assessment influences student learning. If assessment puts an emphasis on factual

recall, students adopt a superficial approach to learning.[11] Therefore; assessment should be designed to assess higher order cognitive skills.

The results of the present study show a significant improvement in the level of questions, from a higher number of recall questions before the workshop to increased number of questions testing higher order cognitive skills after the workshop. The results are in close agreement with earlier published studies that showed an increase in the level of MCQ construction based on Bloom's taxonomy after faculty training.[8,12]

The one best type of questions increasedand one correct type of questions decreased after training, but significant improvement was not noted. A possible explanation of this difference may be that the questions were mostly pertaining to basic sciences and basic science facultyis reported to find it difficult to create one best type questions.[13]

The other item writing flaws like "Issues related to test wiseness" and "Issues related to irrelevant difficulty"were very few to begin with; hence no significant difference was noted before and after the workshop. This may be because the participants had received some previous instruction in proper item construction technique. An interesting observation was that items with heterogeneous options were reduced after the workshop but not significantly. This may be due to the fact that the workshop was conducted once only. Studies show that faculty need repeated practice and instruction to improve all aspects of item writing.[2] This is supported by research that demonstrates that as compared to short course or workshop, long courses may have a more significant impact on quality of MCQs.[12,14,15]

Faculty development workshops help in building the MCQ writing skills and ultimately improve the quality of MCQs. Results of our study also show that according to the participants rating there was a significant improvement in their item writing skills and their ability to identify flawed items immediately after the workshop. Similar results were reported by studies that collected feedback immediately after the training session.[2,8,9] Following a three-day session participants felt that they could frame high quality MCQs and perform item analysis independently.[10] Feedback taken immediately after another one day workshop showed that participants found the workshop to be practical and their expectations regarding MCQ development were met through this workshop.[16]

CONCLUSION

The results of this study suggest that a targeted workshop to train the faculty in item writing skills has a positive improvement in the quality of developed MCQs. The number of higher cognitive MCQs constructions increased significantly after the session. These faculty development trainings should be well structured and conducted on regular basis to achieve long-term benefits.

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LIMITATIONS OF THE STUDY

A limited number of MCQs were reviewed and data of only one workshop was included. Ongoing research by the authors with a larger sample and multiple training sessions will further elaborate the results.

CONFLICT OF INTEREST

None to declare.

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None to disclose.

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Author's Contributions

MAB: Conceived and designed the study, acquisition of data, drafting and critical review of manuscript.

AT, SA: Analysis of data, drafting and critical review of manuscript.

ALL AUTHORS: Approval of the final version of the manuscript to be published.