Strategic Use Of MCQs In Undergraduate Medical Students To Improve Objectivity Of Formative Assessment

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Abstracts: Background and Objectives: Assessment is a matter of continuing concern for medical teacher as it is supposed to steer student learning. Globally there is an increasing trend to move from subjectivity to objectivity. While the universities are custodial for modifying the examinations system as a summative assessment, what is more important for teachers is to mould their formative assessment. University examinations are criticized to be highly subjective and inadequate for covering full range of topics in Pharmacology. Further there is little scope for providing feedback to the students for continuous learning and improvement. In response to this it was decided to introduce multiple choice questions (MCQs) as a tool for formative assessment. Methodology: In the present study, the multiple choice questions were given along with the subjective questionsfrom the same topic to the students. The main aim was to improve the objectivity in students' assessment by introducing MCQs as a formative assessment tool. To evaluate the affectivity of this pattern of assessment from the student's viewpoint, we designed a feed back questionnaire which was analyzed. The MCQs were evaluated by doing Item analysis. Results: The overall feedback revealed that 89% of the students were of opinion that MCQs preparation and examination helped them in learning the subject, self studying, reasoning and enhancement of clinical skills. The present study also clearly indicates that MCQs alone are not sufficient to assess learning and should be used along with subjective tests. Conclusion: To make testing and assessment both fair and consequently valid, MCQs should be used strategically to test important subject content and it should be aligned with subjective tests. [Gupta M et al NJIRM 2012; 3(2) : 113-118]

Key words: MCQs, formative assessment, objective examination, reliability, item analysis

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Introduction: A lot of effort is utilized in imparting appropriate information and knowledge to medical students. In most of the study systems the aspect of imparting knowledge is rightfully given higher priority. But the adequacy of this exercise can be determined only after proper assessment of students at regular intervals.

Assessment of students is a matter of continuing concern for medical teachers as it is supposed to steer student learning. It drives learning in four ways, through its content, its format, its timing and through subsequent feedback given to the examinee[1]. The various modes of assessment are written and oral examinations. The existing written examinations are subject to bias, and are dependent on a number of extraneous variables such as student's handwriting, legibility, content, way of presenting the content and teacher's appreciation of written matter etc. On the whole, the actual knowledge of the student is not judged in a fair and valid manner.

Numerous attempts have been made to increase the reliability, validity and objectivity of written examinations. Multiple choice questions (MCQs) are the most efficient forms of written assessment, being both reliable and valid by broad coverage of subject content[2]. They are probably the most widely used components of objective examinations and are used for formative and summative assessment as well as for various entrance examinations, where ranking of students is of paramount importance.

At our University, written examinations are of subjective type which stress on long, medium and short answer type questions. These are criticized to be highly subjective and inadequate for covering the full range of topics in pharmacology. Further there is little scope for providing feedback to the students for continuous learning and improvement. In response to this it was decided to introduce MCQs as a tool for formative assessment. In the present study, MCQs were given along with the subjective questions to the students. The main objective of this study was to improve objectivity in student assessment in pharmacology by introducing MCQs and also to increase validity and reliability of the written examinations. The long term objective was to frame good quality of MCQs in pharmacology and to set up a question bank for reference in future by the department of pharmacology.

Material And Methods : After doing literature search concerning benefits and drawbacks of different items, four of the faculty members were given checklist and instructions for framing of MCQs[3,4]. They were requested to frame 30 to 40 MCQs per test from different topics. MCQs of one best response out of four, extended matching type, multiple True/False and case based formats were included. Approval from ethical committee was taken before starting the project.

While structuring the MCQs, particular attention was paid to factors such as time to be allotted and weightage given to each type of question. For example True/False statements were given least weightage as it inadvertently provides cues which results in less discriminatory questions[5].

Prevalidation of MCQs was done by the subject experts including one Professor and Head of the Department in Pharmacology. They did not participate in framing of questions, but were involved in the assessment of the content relevance and construction of each question.

Designing the feedback questionnaire:The questionnaire was constructed using both open ended and close ended questions to establish mixed method.Designing of the feedback questionnaire was done by first author and opinion was sought from a closed group discussion with faculty.

The MCQs were evaluated by doing item analysis, i.e. by calculating the facility value (FV), Discrimination index (DI) and distractor efficiency. FV is a measure of how easy or how difficult a question is. It is expressed as percentage. Higher the FV, easier is the question. FV was calculated by the formula[6] :

$$\text{FV} = \frac{\text{HAG} + \text{LAG}}{\text{TotalNumberofStudents}} x100$$

HAG: Higher ability group, LAG :Lower ability group

Discrimination index (DI) indicates the ability of a question to discriminate between a higher ability and lower ability student. DI is indicated as a fraction. The maximum value of DI is 1.0, which indicates as ideal question with perfect discrimination between HAG and LAG.
This was calculated by the formula[6]:

$$\text{DI} = \frac{\text{HAG} + \text{LAG}}{\text{TotalNumberofStudentsineachgroup}} x100$$

Participants: A batch of 55 students of MBBS 2nd professional at our institution were asked to appear in six tests consisting of subjective &objective types of questions on topics including, General Pharmacology, Autonomic, Cardiovascular, Renal, Central Nervous System, Gastrointestinal, Blood, Hormones and Related Drugs Pharmacology.
After the test, manual scoring of both subjective & objective paper was done followed by class discussion of the test. Immediately after the discussion, anonymous feedback was taken from the students by asking them to fill feedback questionnaire in order to avoid bias.

Statistical Analysis: The data obtained from feedback questionnaire was compiled and

analyzed manually by frequency analysis. The MCQs were evaluated by doing Item analysis.

Result: The student's response was evaluated by feedback questionnaire and also by direct questioning during the discussion hour. After the first test, student's feedback revealed that they were contented and grateful for the changes made in the method of assessment. They also requested for increase in the number of MCQs per test and inclusion of USMLE pattern questions.

Table 1: Student's response based on feedback questionnaire

	Strongly disagree N (%age)	Moderately disagree N (%age)	Agree N (%age)	Moderately agree N (%age)	Strongly agree N (%age)
Learning Experience	**0 (0%)**	**2 (4%)**	**9 (16%)**	**11(20%)**	**33 (60%)**
Self study skills	**3 (5%)**	**4 (7%)**	**6 (11%)**	**8 (15%)**	**34 (62%)**
Reasoning skills	**1(2%)**	**5 (8%)**	**7 (13%)**	**9 (16%)**	**33 (60%)**
Clinical skills	**5 (9%)**	**5 (9%)**	**6 (11%)**	**12 (22%)**	**27 (49%)**
Overall	**9 (4%)**	**16 (7%)**	**28 (13%)**	**40 (18%)**	**127 (57.8%)**

N = Number of students%age = Percentage.

The data obtained from feedback was compiled and analyzed. Analysis of feedback revealed that 60% students strongly agreed (rated as five on Likert scale of one to five, one being strong disagreement and five being strong agreement) that MCQ is a useful learning experience and its practice should be continued. Only four percent students disagreed. Sixty two percent students strongly agreed that MCQs improved their self studyand reasoning skills, while49% students strongly agreed that MCQs improved their clinical skills. (Table 1, Figure 1) The overall feedback revealed that 89% of the students were of opinion that MCQ preparation and examination helped them in learning the subject, self-studying, reasoning and enhancement of clinical skills. (Table 1, Figure 3)

Figure 1: Student's response on various parameters based on feedback questionnaire

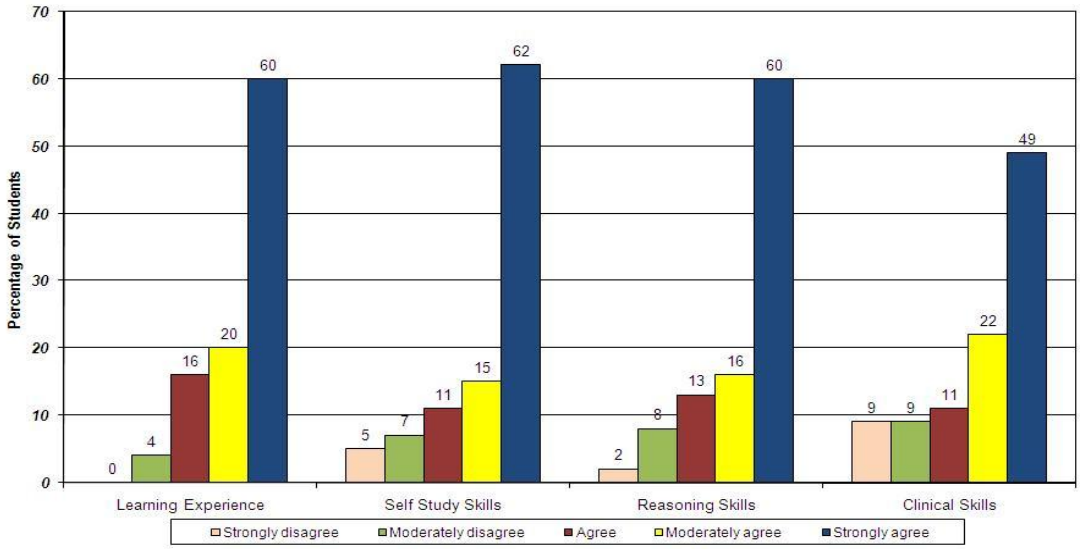


Figure 2: Student's acceptance to MCQs and/or Subjective examination pattern.

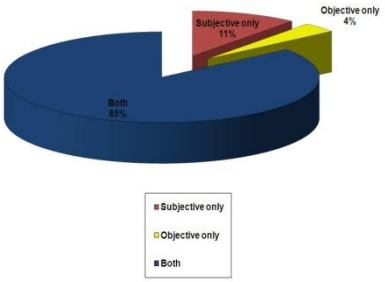
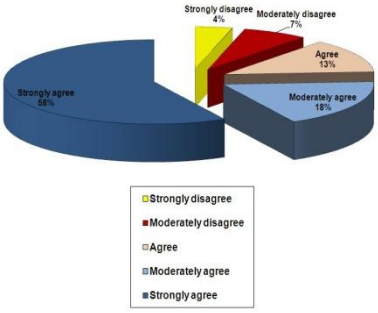


Figure 3: Overall students response based on feedback questionnaire.



Role of MCQ tests and discussions in learning various topics was favored strongly by 58% students and moderately by 18% students. (Table 1, Figure 3) However 85% students were of the opinion that both subjective and objective tests are needed for the assessment and MCQs alone are not sufficient to adequately assess their knowledge. (Figure 2) Almost all the students (95%) approved that the quality of MCQs was good, relevant and clear. Regarding study pattern, the study revealed that all the students referred to standard text books, 72% students discussed the topic with their classmates and 28% with senior students. Seventy eight percent students revealed that MCQs changed their method /style of study. It helped them in correlating different topics.

They tried to understand the topic, read it in depth and gave more attention to the minute details of the subject matter. Their concepts regarding the subject matter were lucid and they felt more confident. Students were of the opinion that MCQ test preparation and its discussion would improve their performance in both written and oral examinations and also help them in postgraduate entrance and other competitive examinations.

Item analysis of various items exhibited varied comments like ideal FV and poor discrimination, easy with acceptable discrimination, good with poor discrimination, Good question, difficult with good discrimination difficult with poor discrimination, poor question and easy with poor discrimination. The question with a satisfactory level of FV and DI were used for making question bank.

Discussion: Assessment has many powerful effects on student learning[7, 8]. These effects include not only what is learned, but also students' approach to learning. Students study more thoughtfully when they anticipate certain examination formats, and changes in the format can shift their focus to clinical rather than theoretical issues[9]. Formative assessment occurs when educators feed information back to student in a "low stakes" manner that enables the student to learn better and engage in a self-reflective process regarding the feedback[10, 11]. Its purpose is to provide both feedback on performance and suggestions for improvement[12, 13]. Such an assessment can be provided using a wide range of methods.

In the present study two assessment methods were used, multiple choice questions and subjective questions. Fifty five students appeared in both subjective and objective tests and responded to a questionnaire where they were asked to rate (on a 5 point likert scale) their response to general questions.

Results of the present study clearly indicate that MCQs alone are not sufficient to assess the learning and should be mixed with subjective tests. Similar study by Frederiksen showed that MCQs have limitations like difficulty in framing MCQs that are rich in context[14]. MCQs can also create situations in which an examinee can answer a question by recognizing the correct option, but could not have answered it in the absence of option[15]. This effect is called cueing effect. Extended matching items can minimize cueing[16]. Another study revealed that MCQs emphasize recall of factual information rather than

conceptual understanding and integration of concepts[17].

Subjective test alone is also not sufficient to assess the students learning as they are criticized to be highly subjective and inadequate for covering full range of topics in Pharmacology. It is also dependent on lots of variables such as students' handwriting, legibility, teacher appreciation of written matter etc. so on the whole the actual knowledge of the students is not judged in a fair and valid manner[18].

All the methods of assessment have strength and intrinsic flaws. The use of multiple methods of assessment can overcome many of the limitations of individual assessment formats[1, 19, 20, and 21]. Vander Vleuten[1]describes five criteria for determining the usefulness of a particular method of assessment ieReliabilty, Validity, Impact on future learning and practice, Acceptibility to learners and faculty, Costs (to the individual trainee, the institution and society at large).

Conclusions: Assessment drives learning. If the assessment system can be made fair then students are more intend to study the subject rather than only prepare for the examinations.. "The assessment tail wags the curriculum dog" or Grab the student by the tests, their heart and mind will follow[22]. To make testing and assessment fair, MCQs should be used strategically to test important subject content and it should be used along with subjective tests. Initial impact of the study has been reflected in the form of increased demand for more MCQs especially by the students and its better acceptance from the colleagues. A ground has been created for frequent and regular implementation of the MCQs in the class tests along with subjective tests. The university is also considering introduction of MCQs for summative assessment.

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