



BLDE (Deemed to be University)
Shri B. M. Patil Medical College Hospital
and Research Centre Vijayapura
Medical Education Unit

**'Being a Competent
Medical Teacher'**

EDITOR

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9 MULTIPLE CHOICE QUESTIONS (MCQS)

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During our students days, we have felt a lot of dissatisfaction over the marks awarded to us in essay type questions. Most of the times, it is that marks do not reflect the true capability. Some studies conducted to assess the marking of essay type questions have shown that there may be a difference of as much as 25% marks between two examiners, which in effect means that the same candidate may be failed by one examiner and awarded distinction by another. There are ways and means to check this kind of discrepancy. However, they are time consuming and given the constraints of time, very few teachers would be willing to assess essay type questions using accepted methodology that is by using model answers. Even if the essay type questions were to be evaluated by the recommended method, it would take a long time to rebuild faith of the students in such a system of examination. Besides being liable to be subjective marking, essay type questions also have another limitation and that is the number of questions that can be asked within the allotted time. Thus even with careful and planned marking, essay questions are bound to have a low reliability.

Against this background, multiple choice questions offer a distinct advantage of being more reliable not only because of a predetermined correct answer but also because of the more contents being tested, easy to mark and can be used on repeated occasions. They provide the wider sampling of subject matter.

MCQ's are being increasingly used for the last two decades for formative and summative assessment. The aim of evaluation is to assess students

achievements as well as efficacy of the teaching programme. The assessment should be able to classify students into categories of bright, passable (or acceptable) and below standard. It should serve as a feedback to both teachers and students indicating areas of strength or weakness. Scoring in MCQ's is not simple and involves many complex issues. Different methods are applicable to different types of MCQ's. However, the correct answers are predetermined and a candidate gets the same marks in the hands of all the examiners for a given question. In that respect, marking of MCQ's is considered simpler as well as more objective than marking of essay type, short essays and short answers. A basic question that confronts MCQ test constructors (examiners) and students (examinee) is how to judge the quality of the test.

In the field of education, objective evaluation is becoming more important for both summative & formative assessment. One of the most commonly adopted methods of objective assessment is Multiple Choice Questions (MCQ). MCQ are used globally for assessment in various fields of education. MCQ are also used for undergraduate & postgraduate entrance examination including medical, technical & other fields. MCQ are commonly used in entrance examination due to the logistical advantage of being able to test large number of students & broad range of knowledge in short period of time. MCQ also lends the possibility of flexibility during online examinations by drawing questions on random from the question bank. As large number of MCQ can be developed for a given content area, which provides a broad coverage of subjects that can be tested consistently, which would enhance reliability of assessment. If MCQ are drawn from a representative sample of content areas that constitute predetermined learning outcomes, which would ensure a high degree of test validity. Critics of MCQ argue that MCQ are unable to test higher level learning. This criticism is more often attributed to flaws in the construction of the items rather than to their inherent weakness. Appropriately constructed MCQ can result in objective testing that can measure knowledge, comprehension, application and analysis abilities. Genuine issues related to MCQ are that, they are difficult and time-consuming to construct especially in cases where higher order cognitive skills are being assessed. Cueing effect can result in guessing & can lead to failure in accurate interpretation of scores & impact an assessment, hence items must be constructed free of such flaws & should be able to discriminate between good & average/poor performer.

Why do we need good MCQs?:

Faulty items interfere with accurate and meaningful interpretation of test scores. This can have an adverse impact on student pass rates. Therefore, to develop reliable and valid tests, items must be constructed that are free of such flaws.

Components of MCQ:

- Item - The entire unit of MCQ which consists of a stem and options.
- Stem - Question, statement or lead-in to the question.
- Alternatives/Options/Choices - The choices that follow the stem
- Keyed Response - The correct option/options
- Foils/distracters – Incorrect choices/options

Different Formats of Multiple-Choice Questions:

Single Correct Answer/One best response type/Type A:

- This is traditional and the most frequently used type of MCQ.
- A series of 5 choices is preferred to a series of 4 as it reduces the chances of random guessing.
- Instructions to the examinee emphasize the importance of selecting one best response among those offered.
- The usual time permitted for this format is 40 to 50 seconds per question.
- Most common format
- Usually tests only recall of facts
- Can be constructed for problem solving abilities, interpretation or analysis
- Difficulty – to find plausible alternatives
- Items of the negative type of single best response - Student is directed to identify either the alternative that is an incorrect answer, or the alternative that is the worst answer.

Multiple completion type (Type K) Response:

Here the candidate is instructed to separately respond to each of four or five choices so that any combination of right and wrong may be permitted. This is the common format used in UK for the PLAB and fellowship examination for Royal societies. The time required to answer each question is about 70 seconds. This format has several advantages. The usual restriction in demanding / testing extreme situations such as

“the best reason” or “the most accepted cause” etc, which are often debatable can be left out. However this format needs care while formulating. If not, this may test only recall and the stem may be short and implicit.

- Two or more of the alternatives are keyed as correct answers & remaining alternatives serve as distracters.
- Answers with the help of standard code – A if 1,2& 3; B if 1& 3; C if 2 & 4; D if only 4 & E if all are correct
- The student is directed to identify each correct answer.
- Can be scored in different ways.
- Scoring done on 'all-or-none basis' or scoring each alternative independently.

Multiple True/False completion type (Type C):

Multiple true false format consists of a stem followed by 4 or 5 true or false statements. The stem may be in the form of a question, statements, case history or clinical data. Each of the completions or statements offered as possibilities must unequivocally true or false (in contrast to single best response) This type of question should be written so that no two alternatives are mutually exclusive. Instructions should be clearly given at the beginning of any section in which this format occurs in the test and if possible, an abbreviated code should be given at the top of every page.

- Most common format in PLAB

Relationship analysis type (Type E):

These are variation on the basic true/false question form. Each item consists of an assertion linked to a reason by the connecting because. The examinee has to decide whether the assertion or reason are individually correct or not and if they are both correct whether the reason is the correct explanation of the assertion. This type is among the most hotly debated of all objective items largely because of the amount of language comprehension involved. This reduces the likelihood of correct responses for certain examinees. As a result many examiners reject these items even though they test the higher cognitive domains. If properly used they have the ability to discriminate among students at higher levels of ability.

The usual time permitted for this format is 50 seconds per question. Another reason why this format is becoming unpopular is the difficulty in scoring.

- Two statements are asked to respond by choosing –
 - o A, If both statements are true & casually related
 - o B, If both statements are true & not casually related
 - o C, If the first statement is true & second is false
 - o D, If the first statement is false & second is true
 - o E, If both statements are false

Matching the Following Type:

This consists of two lists of statements, words or symbols which have to be matched with one another with specific instructions. The two lists may contain different number of items. These formats are well adopted for measuring relationship between large amount of factual information in an economical way. However, it is very difficult to test any higher level of ability with this format.

- Less commonly used
- Number of choices on right side should be more than left side.

Validation – two stages:

1. Pre-validation –

This exercise is done before the examination. A committee consisting of three or four members, two of whom should be subject experts other than the person who has set the MCQ paper, goes through the paper to assess the relevance of the contents and construction of the each question. Only those questions which are found to be appropriate by this committee should be used in an examination.

- To avoid inclusion of defective items
- Steps in pre validation are – relevance to learning outcome, clarity, appropriateness, level of cognition, grammar of construction

2. Post-validation (Item analysis)

- This is done after a test has been conducted and scored, But before the results are announced.

- Post validation is also a team effort in which two or three teachers involved in the administration of test should take part. Several different processes and indices of item quality have been developed. These include:
 1. The difficulty of the item (difficulty index or facility value)
 2. The discrimination power of the item (discrimination index)
 3. The effectiveness of each alternative (distracter functionality or effectiveness)

Construction of items based on Bloom's taxonomy:

Apart from the guidelines mentioned above, knowledge of Bloom's taxonomy is certainly an added advantage for item writers. It can serve as a guide to construct more stimulating items. Assessment items developed using this framework will include a range of levels and thinking processes (Haladyana and Downing, 1989). Keep in mind that we want our students to think, make connections, question the information included in the problem, process the information, and reflect on their answers. Each category requires more complex thinking than the one preceding it and incorporates the preceding types of thought in order to proceed to the "higher levels".

Use of AOTA (All of the above) and NOTA (None of the above) deserves a special mention as they seem to be most commonly used (abused) in our MCQ papers.

MCQs for integration:

Most of the Indian medical colleges follow the conventional discipline based approach. An attempt to rope in horizontal and vertical integration from certain corners is a laudable effort. It is a welcome sign that our medical teachers have started debating and discussing problem based learning (PBL) and case based learning strategies; some even daring to implement them. However these strategies are often demanding in terms of infrastructure and logistics. Instead, one may consider using MCQs to integrate across various disciplines. Carefully constructed MCQs can cut across disciplines and probe the critical thinking and reasoning skills of the students examined (Azer, 2003). The EMQs and assertion reason types are excellent strategies in this context.

Using MCQs in an intergrated format where a conventional discipline based curriculum is followed should be done with proper planning and extra caution. It will be wise enough to address these issues before you embark on this daunting task.

General guidelines for writing good MCQ: Procedural Guidelines:

- Corporate rather than individual efforts is desirable in preparing MCQ's.
- Individuals write questions on the basis of initial guidelines and stated educational objectives.
- Is the level of difficulty/discrimination appropriate.
- Clear instruction for the process of marking the right choice/choices on the answer sheet.
- Include MCQ of varying levels of difficulty.
- Format the questions vertically, not horizontally (i.e., list the choices vertically)

Content-related rules:

- Cannot test motor skills like communication skills, psychomotor and interpersonal skills.
 - Question should be based on student learning objective of the course.
 - Focus on a single problem or idea for each question.
 - Keep the vocabulary consistent with the students' level of understanding.
 - Avoid providing cues from one question to another; keep each question independent of one another.
 - Use examples from course materials as a basis for developing your questions.
 - Avoid overly specific knowledge when developing questions.
 - Avoid verbatim phrasing when developing the questions.
 - Use multiple-choice to measure higher level learning/knowledge.
- Stem construction rules:
- Is it clear, concise and unambiguous.
 - Are double negatives avoided.
 - Does it ask for an opinion.
 - Does the stem deal with one or more important aspects of the subject.
 - Appropriate for the level of knowledge expected of the examinee.
 - Central problem stated clearly and accurately.

- Written with as few words as possible to make it clear and complete.
- Is the stem type the one for the particular point or problem.
- Is the stem written in conformity with the designated format.
- State the stem in either question form or completion form. The blank in completion questions should always be at the end of the stem.
- Stem directions should clearly indicate to students exactly what is being asked.
- Word the stem positively; avoid negative phrasing such as “not” or “except.” If this cannot be avoided, the negative words should always be highlighted by underlining or capitalization: Which of the following is **NOT** an example
- Avoid giving clues such as linking the stem to the answer (... Is an example of an: test- wise students will know the correct answer should start with a vowel)

Guidelines for Developing the Options:

- The proper number of choice must be grammatically correct and consistent with the main statement and with each other.
- Checked to avoid duplication and to be certain that one item does not give clue.
- Do all options complete the stem grammatically.
- Are they logical and plausible.
- Place options in logical or numerical order.
- Use letters in front of options rather than numbers.
- Keep options independent.
- Keep all options homogeneous in content.
- Keep the length of options fairly consistent.
- Avoid or use sparingly, the phrase all of the above & none of the above.
- Provide four to five options for each question.
- Phrase options positively, not negatively.
- Avoid distracters that can clue test-wise examinees.
- Avoid giving clues through the use of faulty grammatical construction.
- Avoid specific determinants, such as never and always.
- Position the correct option so that it appears about the same number of times in each possible position for a set of questions.
- Make sure that there is one and only one correct option in case of single response MCQ.

- The greater the similarity among alternatives, the greater the difficulty.
- Guidelines for Developing Distracters:
- Wrong answers should be sufficiently close to the right answer to serve as effective distracters but still not so applicable as the one BEST response.
- Silly or irrelevant answers fool nobody and have the effect of reducing the multiplicity of choice.
- A distracter is effective if more of the lower ability students pick it incorrectly as the correct answer and less of the higher ability students pick it as the correct answer.
- A distracter picked up as correct answer by less than 5 percent of students is a poor distracter.
- Use plausible distracters.
- Incorporate common errors of students in distracters.
- Avoid technically phrased distracters.
- Use familiar yet incorrect phrases as distracters.
- Use true statements that do not correctly answer the question.
- Distracters that are not chosen by any examinees should be replaced.

Distribution of

| MCQ's: Topics | No. of Items |
|-------------------|--------------|
| Must know | 70 |
| Desirable to know | 20 |
| Nice to know | 10 |
| <hr/> | |
| | 100 |

Although the discussion has been rather long, it has been tried to show you some of the common pitfalls that can creep in while writing a good item. It is worth emphasizing that the time and effort spent in writing a good item is more than repaid in the long run.

Contrary to the notion that MCQ tests dumb-down higher order learning ideals, in many instances the literature strongly supports the fact that they are able to provide information about student's higher levels of understanding. If items are correctly designed these tests are no way inferior in assessing the depth and breadth of students' knowledge.

Medical teachers cannot abstain from objective forms of assessment. The only way out is to frame good items, evaluate them and appreciate their place in the field of written assessment.