Multiple Choice Questions As A Teaching Learning Tool In Addition To Assessment Method

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Abstracts: Background and Objectives: Learning of a subject becomes effective when the student knows the purpose of learning. The guidance on the relevance of content of basic sciences to clinical sciences is important. Reinforcement of knowledge is essential to indicate the key areas of the subject for in depth study. The aim of the present study was to focus the students on relevant content and educational objectives through multiple choice questions. Methods: The study consisted of an intervention and a control group of seventy five students each. The intervention group was exposed to the new concept of weekly assessment with concept based MCQs. Results: The methodology has been effective in the study group. This has been demonstrated by the mean scores of the study group (17.67 ± 1.72) being higher than the control group (13.6 ± 2.34) ($P < 0.01$). Program evaluation by the students has revealed that they developed interest to study the subject in depth. It has helped them in comprehending and reinforcement of the conceptual knowledge and guided them to apply it clinical sciences. Conclusion: Well structured MCQs in the form of assessment with an immediate feedback with explanation of the applied anatomy improve the critical thinking and reasoning skills of the student. [Appaji A et al NJIRM 2012; 3(4) : 91-95]

Key Words: clinical anatomy, effective learning, formative assessment, multiple choice questions.

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Introduction: Anatomy is the basis of all Medical knowledge and needs to be carried on and implemented in the clinical phase. As there is a lot of volume overload the student tries to do surface learning by rote memorization at the time of examination. Thus learning becomes examination oriented than objective oriented.

After the examination the superficial knowledge gained is forgotten. In order to avoid this we need to correlate basic sciences and clinical sciences and assess them accordingly. The identification of the key areas for in depth understanding of the subject by the student is the responsibility of the teacher.[1]

When the knowledge they gain by various teaching learning methods is taught with relevance to its need in clinical phase, the content becomes important and learning is effective. Many methods of learning are present in order to make the student understand the subject. In view of this, the aim of the present study was to introduce the Multiple Choice Questions (MCQs) (concept based ones) as a formative assessment and a teaching learning tool for clinical anatomy to the medical students for better comprehension and application of learning i.e. second and third levels and to some extent the fourth level of Bloom's taxonomy [2,3].

Material and Methods: The study was conducted on medical Phase 1 students of M. S. Ramaiah Medical College, Bangalore. Ethical clearance was obtained from the institutional ethics committee. The study was carried on a control and study group consisting of 75 students in each group respectively. The study and control group students were selected by randomization using random number table.[4] The confidentiality of the student's identity was maintained during the assessment of the effectiveness of the program.

Small portions of anatomy taught during the week were given to the study group to prepare for the MCQ test. The content included all divisions of Anatomy-gross, histology, embryology, osteology. Both direct and concept based questions were put forward to the students during the weekend (usually Fridays). The concept based MCQs were developed as a case scenario with the question being mainly on the basic science- Anatomy. The MCQs were prevalidated by subject experts of Professor Grade.

After the test, each question was open to all the students to reason out their answers and the facilitator interpreted with help of illustrations to derive to the answer.

The answer papers were also evaluated and the scores tabulated. At the end of the intervention (after the university examinations) a common test was conducted to both the control and study group. The content of the test included MCQs focused on clinical anatomy. This question paper was validated by the subject experts before conducting the test. The answer papers of both the study and control group was coded to avoid identity bias and then evaluated.

The program evaluation in the form of questionnaire (included open ended and closed ended questions) by the study group was also done with a scoring on four-point Likert scale. The questionnaire is enlisted in Table 1.

Statistical evaluation: Descriptive statistics such as mean, SD were calculated. Student "t' test was employed to test the differences in mean scores between the intervention and control group. SPSS software version 18 was employed for analysis of data. The program evaluation consisted of a questionnaire. The scoring was based on a Likert scale ranging from 0 to 4.

Result: Result analysis has revealed better scoring by the study group than the control group. The mean score in the study group was 17.67 ± 1.72 and the control group was 13.6 ± 2.34 ($P < 0.01$). The program evaluation results have been tabulated in table 1.

Table1: Scoring on four-point Likert scale regarding the program evaluation by the students

Sl. No.	Question	Score	Standard Deviation
1.	Was the method interesting	3.03	±1.36
2.	Was impactive on the students	3.42	±0.89
3.	Was self motivated to attend the tests	3	±0.71
4.	Prepared for the tests regularly	2.32	±0.90
5.	The time period for the test preparation was adequate	3.2	±0.71
6.	Timing of the class-(Friday 3.30-4.30pm) was appropriate	3	±1.05
7.	Concepts of applied anatomy was understood	3.55	±0.53
8.	Interpretation given was accurate	3.45	±0.63
9.	Time spacing for the questions (1 min) was adequate	3.5	±0.54
10.	Helped to answer Short Answer Questions	2.7	±0.79
11.	Required illustration for better interpretation	3.2	±0.76
12.	Created increased interest levels in the subject	3.19	±0.79
13.	Would help in clinical postings	3.59	±0.66
14.	Such classes should be continued for future batches	3.72	±0.74

Discussion: The present study has aimed at using an assessment method as a teaching-learning tool in conjunction with evaluation.

The major parameter assessed by MCQs is factual knowledge, but with careful attention to question formulation it is argued that critical thinking and different cognitive categories according to Bloom's taxonomy can also be tested, of these in particular are knowledge, comprehension, application and analysis.[2,3]

Multiple-choice Questions (MCQs) are a subset of what are referred to as "objective" questions. The term "objective" here means there is complete objectivity in marking the test. The acceptance of MCQs as a good assessment method has had both positive and negative reviews. The positive aspect is that it can be used for a large gathering of students at a single point of time. The scoring is good so, motivating to the students. The negative aspect is that it leads to superficial reading.[5]

But the new concept based well structured MCQs need understanding of the subject which caters to the need for higher level of Bloom's taxonomy of cognitive domain. This study has utilized MCQs which require linking of the clinical scenarios with the basic anatomic knowledge. Higher levels of cognitive domain like comprehension and analysis of the subject studied are needed for solving the above said MCQs.

Thus concept based MCQs has been used here as teaching-learning method in addition to assessment for reinforcement of the knowledge received by the other usual teaching – learning methods. A study was conducted to observe the effect of post testing after a training course in resuscitation by using an intervention and control group. The results have shown that testing after a training course helps in increasing learning outcome.[6] Thus, assessment truly helps to stimulate learning. Formative assessment is a type of periodic assessment that happens throughout the course. Frequent small tests tend to be more effective than summative long tests. Assessment which invites discussion from the student regarding a particular topic might be one of the good methods.[7]

The present study involves a weekly formative assessment in the form of high order MCQs covering small portions. The students were asked to explain the reason for the choice of the key which led to active participation by the student than just passive learning that happen during the didactic lectures.

A questionnaire was used to survey the effect of assessment of Anatomy taught on student learning in a medical school in London. The survey revealed that increased weightage to assessment in the subject Anatomy definitely motivated the students to learning.[8] The present study by weekly assessments has stimulated the students to learn more effectively and lead to timely revision. One of the purposes of assessment is to support student learning. The effect of formative assessment is to give feedback about the strengths and weaknesses in order to develop and improve knowledge, attitude and skills.[2] The present study aims at feedback and improvement in knowledge and attitude.

Medical education aims at linking the assessment with the educational objectives. The educational objectives should be such that the knowledge gained must be applied in their day to day practice. The students must be trained to think and apply the knowledge that they imbibe from the content. The content taught must be relevant to the clinical subjects.

Keeping this in mind the above methodology was devised in order to instill in the student, the qualities of interpretation and application of knowledge. The key areas of curriculum of relevance were identified as the student went through the process of the methodology. This also avoided unnecessary rote learning as the conceptual knowledge was being inculcated into the student

After the test being conducted, the next part was to discuss the answers given by the student. Initially the rationale behind their answering was elicited by the students as an explanation for their choice of option (key). Later a cumulative interpretation of each question was given by the facilitator as an immediate feedback.

A study involving the usage of two tier reflective multiple choice questions was conducted wherein the students along with answering the traditional MCQs, also had to explain the reason for answering the question. By this the pupils were enabled to creatively think, develop and organize their ideas. By this an effective feedback could be given to students to correct their errors in thinking and understanding.[9] This concept was similar to the present one.

Not many assessment methods address the need and advantage of the feedback[10] The innovative technique that has been implemented here gives a descriptive and evaluative feedback after eliciting the rationale from the students. The feedback gives the details of how to derive the answer with

help of illustrations. By this immediate feedback, the student is assured of his method or direction of thinking when he is right and it helps the student immediately to correct their comprehension and analysis when they are wrong. Along with assessment there is a feedback.

In the present study, after the MCQ test, the students were given an opportunity to give the rationale for each answer. Then the facilitator reassured with help of illustrations and discussions. Thus, there was a combination of assessment and an immediate feedback session.
The result of the tests has shown that the methodology has been effective by higher scoring in the study group. The effectiveness of the methodology has been proved as mentioned in the results ($P<0.01$).

The other advantage was reinforcement of knowledge learnt during the week. By the student learning the weekly portions and getting to know what was relevant of the taught content, there was reinforcement happening. The fear of examinations, lack of revision had diminished as there was timely revision and retention of conceptual knowledge than rote memorization. The methodology has assisted the students to revise regularly which is a positive point in the hectic curriculum being covered in a short period of time (1yr).

In spite of assessment being dreaded by the student, these test series were interesting as there was scope for learning. The results of the program evaluation reveal that the test series with immediate feedback has created and increased interest levels in studying of the subject (table 1). Raising the interest level with set induction by case scenarios sensitizes and exposes the student to the clinical phases and this creates interest and instills motivation to study. Motivation is one of most important and difficult attribute to inculcate into the student which has been addressed to in the present study.
The students feel that the new methodology has had a positive impact on the students on their method of learning the subject as they were getting oriented in the test series. The test series has acted as a guide for the student and facilitated their learning.The students perceive that such type of exercises would help them in their clinical postings. As the sensitization and linking of the clinical subjects with basic sciences was happening through the case scenarios in the MCQs. Another advantage to the students was that the tests and interpretations have motivated them to study the subject in depth by referring higher and clinical books. Thus self learning process has been initiated in the student to gain depth in knowledge. MCQ examinations which match the educational outcomes can be used to assess student's performance and immediate feedback can facilitate self learning.[11]

Another important aspect that was revealed in the questionnaire results was that the test series had also aided the students to answer the short answer questions (2.7/4). Thus the test series have been instrumental in helping the students to perform better in the academics. Among the open ended question of comments on the program, the positive comments were increase interest in the subject (46.7%), motivation to study (10%), instilled thinking abilities (7.6%) and made them gain confidence in the subject.

The negative aspect of the program was timing of the test. Though closed ended questions revealed that the timing of the test was appropriate (3.2/4), open ended comments showed a few students expressing it as inappropriate. The students felt that Fridays between 2.00-4.00 pm was tiring after the hectic morning session. But feasibly this was the only time available as these hours belonged to anatomy and easier to coordinate.

Educational effectiveness of assessment refers to student's motivation to perform well and direct the study towards the intention of the curriculum mentioned. Feasibility addresses the essential needs of affordability and efficiency for testing purpose. The acceptability deals with interest of the stakeholders in the process.[12]

The authors feel that the present technique has been able to address the above said attributes. The MCQs test series caters to educational effectiveness of second and third levels of cognitive domain (3.55, 3.59/4) and gone one step ahead to ask for rationale in answering and give immediate feedback to the students which is one of important feature of assessment. Any assessment without feedback is incomplete.

Regarding feasibility, MCQs are the best way to assess large group and resources have been affordable. Power point was prepared to demonstrate the question and answers with illustrations. Notebooks were used for answering by the students**.**

Regarding the acceptability of the methodology to the stakeholders, program evaluation by the students has revealed their acceptance and they have recommended similar exercises to the forthcoming batches (3.72/4). The medical education unit members have accepted the idea as the need of the present curriculum of focusing on the relevance of content. This program started in 2007 and has been continued till date.

Conclusion The multiple choice questions as a teaching-learning tool in addition to assessment for clinical anatomy has been successful in the study group. The performance has been significant in the study group (P<0.01).Well structured multiple choice questions with case histories is a good method for increasing the interest levels to study in depth and with better understanding. This type of learning session in the form of feedback immediately after the assessment has oriented the students towards application of knowledge.

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