

Assessment Methods - Integrated with teaching learning and skill development process in medicine

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Abstract

Medical education, the art and science behind medical learning and teaching, has progressed remarkably. Assessment is entering every phase of professional development. A wide range of assessment methods currently available include essay questions, patient management problems, modified essay questions (MEQs) checklists, OSCE, student projects, Constructed Response Questions (CRQs), MCQs, Critical reading papers, rating scales, extended matching items, tutor reports, portfolios, short case assessment and long case assessment, log book, trainer's report, audit, simulated patient surgeries, video assessment, simulators, self assessment, peer assessment and standardized patients. Assessment has a powerful positive steering effect on learning and the curriculum. Assessment is purpose driven. Mastery testing (criterion-reflected tests) requires that 100% of the items are measured correctly to determine whether students have attained a mastery level of achievements. Self assessment (self regulation) is a vital aspect of the lifelong performance of physicians. Self assessment approaches include: written exams (MCQs, True/False, Essay, MEQs, modified CRQs), performance exams (checklists, global rating, student logbook, portfolio, video, etc). Long Essay Questions can be used for assessment of complex learning situations that can not be assessed by other means (writing skills, ability to present arguments succinctly). The questions can incorporate clinical scenarios.

Keywords: Internal assessment, Feed-back, Formative assessment, Summative assessment, Pair and share, One minute paper, One minute preceptor, Skill development.

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Introduction

Gone are the days when teaching used to be merely a one-way didactic class room teaching process and examination centric; just to reproduce the conventional 'Rote learning' material in the summative course-ending final examination to 'Pass' or 'Fail'. There is a felt need to integrate the internal examinations in a continuous manner with each session of teaching-learning activity, may it be a class-room teaching or practical classes in the laboratories and clinics; with due bi-directional feedback between the teacher and the taught, to rightly call it a 'Formative assessment' process continuum'. Not only it demystifies the evaluation process in a much more transparent manner, it also takes the students, parents and all the stakeholders into due confidence. The process communicates evaluation outcomes in a positive manner, highlighting competence and skill development as a tool for self-evaluation, keeping in view of the students' maturity level too. Need not to over emphasize that the evaluation process has to be participatory as well as humane. The method of evaluation has been discussed in this review with

special reference to 'Formative assessment' as a teaching-learning-feedback continuum.

Goals

1. To assess Students' Learning and Performance
 2. To assess teaching
 3. To assess departments and programs
1. Learning by students can't be invisible. Therefore, it must be assessed through performance tests in formal and informal settings by testing their understanding of concepts, class or home assignments, group work and examinations—written, verbal, practical, clinical and so on.
 2. To assess teaching, the strengths and weakness of teachers must be introspected and gaps if any must be bridged to improve effectiveness of teaching. The methods include early course feedback, student surveys, observing their focus groups, one-to-one consultations and their ultimate placements.
 2. To assess the departments and programs, it is worth while to systematically document each program on their outcomes vis-à-vis the assessment processes. This is bound to showcase how the programs are using data and information to continually improve their quality and effectiveness. The outcome can directly be tied to 'Curriculum Review and Revision Committees' represented and supported by academicians. Such empowered expert body have to under take regular collection, review, use

information for continually improving student learning and overall program effectiveness.

Grading

Assessment and grading are not necessarily the same. The goal of grading is to evaluate individual students' learning and performance. Although both the terms are used interchangeably as measures of student learning, grading is not always reliable to incorporate other student attributes like attendance, participation, sports, music, social service, empathy and other efforts on the part of students. Those are not direct measures of learning. However, grading can play a role in assessment. But assessment goes much beyond grading by systematically examining patterns of student learning to improve educational practices in various courses and programs.

Assessment types:

There are two types of assessment in teaching-evaluation process -summative and formative.

- a) **Summative assessment:** Summative assessment is the final evaluation of a program, on a standardized benchmark of high stakes and with high point value. It is primarily used to ensure accountability at qualifying examination. Conventionally, we understand SA as a course or semester ending final examination, in order to determine 'Pass or fail' status of a student, following a particular curriculum.

Format: Written in the form of MCQs (maximum 20%), short (40-50%) and long answer (30-40%) types, of equal weightage in practical or clinical examinations as the case may be, OSPE/OSCE and viva-voce.

Difficulty level: 60 to 70% of questions are usually put from the 'Must know' domain of the curriculum so that average students qualify in the evaluation process. 20 to 30% questions may be set from 'Desirable to know' and 10 to 20% from little in-depth 'Nice to know' domain in order to differentiate between the average and meritorious. The student has to face increasing difficulty to secure higher marks. Passing head should be minimum 50% in any technical or professional course.

Limitations: The limitations of such assessments are known (Oxford). It leaves a greater scope for human involvement and the resultant limitations spilling out of 'Impressions', 'Likes and dislikes', mood, physical, mental, psychological, cognitive levels of evaluators. These aspects matter a lot in the melee of stereotype and repetitive nature of evaluation process in a limited time frame. It is really difficult to evaluate an individual in a day or in hours on the knowledge or skills acquired over a 1-2 year or 4-5 year period, spent on getting trained on a particular course. The key qualities like regularity, punctuality, sense of duty, desire to serve, eagerness to willingly accept responsibilities,

accountability, compassion, empathy towards patients and so on, are ignored in the process. One doesn't get a fair, realistic picture of what students actually mastered. There is an over reliance on recall, not enabling students to apply concepts for problem solving. As there is practically no scope for feedback, the much needed remedial instructions are neither provided, nor enforced. There is no scope for students to identify their strengths and weaknesses and target areas where they need to work more. On the other hand, there is no scope for the faculty recognize as to where the students are having actual difficulties and accordingly address the problems then and there.

- b) **Formative assessment:** It is defined as "The information communicated to the learner that is intended to modify his or her thinking or behaviour for the purpose of improving learning" (Shute, 2008)¹. It is a powerful driver of learning, involving dynamic interaction between students and teachers, ensuring quality education. Using simultaneous feedback as a tool, the formative assessment provides students the much-needed confidence, self-regulated skills to seek knowledge and autonomy for life-long learning. It is not restricted to mere paper-pencil tests. All other methods such as-quizzes, conversations, interviews, audio-visual applications, projects, practicals and assignments, integrated in the process. Periodic assessment outcomes are shown to students and parents to encourage them for continuous and participatory improvement. In the process, the students are made aware of the real 'Learning outcome'. They are encouraged to examine their learning needs to achieve their goal and the exact need for success. They are engaged in assessment of their own work as well as that of their peers. Placing assessment as heart of learning, a well developed FA program can be an effective way in influencing the institutional culture and continued educational development process. Advance planning is required. Clear criteria and performance standards, against which the assessment is proposed, must be set beforehand. It is desirable to communicate such criteria or performance standards, well in advance. It is better to obtain specific feedback from student groups, based on the set criteria or performance standards before actual evaluation/teaching commences.

Methods

It is directly integrated to a course/unit/semester and tied to the learning objective as part of any day-to-day lecture/clinical case presentation/ practicals/ group discussion. Students' self-directed activities with bi-directional feedback mechanism are in place.

Tools

1. Pre-reading quiz / MCQ,
2. One minute paper,
3. Think-Pair-Share,
4. Practice quiz /MCQ,
5. One minute Feedback

Formative assessment summative

Pre Quiz: Initiate the topic	2. One Minute Paper	3. Think, pair, share	4. Teaching (Lecture / Practical or Clinical)	5. Practice, Quiz, MCQ: Clickers /Online
Lecture				
Practical / Clinic / Procedure				
Beginning of Course / Unit time line				End of formative assessment

Table 1: Formative assessment starts with beginning if a course or semester as a continuous process, duly integrated with teaching at each level and form but terminates prior to the final summative assessment.

1. **Pre-reading quiz:** First of all, the topic is introduced, may be in a minute or two. Thereafter, through few short questions and interactions, the students are initiated to the topic at the very beginning of the class / practical or clinical session. It can be taken paper based MCQs, on-line or on 'Student Response System' through clickers. Clear, prior instructions on the task and expectations must be explained before administering the exercise. Opportunity may be offered to retake quiz without any penalty. Now, the topic is covered in a didactic form, highlighting the must know, desirable to know and nice to know areas. In light of the topic delivered, their answers to the previous exercise are discussed with adequate feedback on specific areas for improvement, enabling students to identify their own learning goals. Maximum focus is given to students known to be average in the class than on high achievers, who in any case will pick-up any way. The weaker section may be offered help in small tutorial groups separately.
2. **One minute paper:** One or two vital questions are posed to the group, relevant to the topic under discussion. Allow a minute for students to individually jot down own points on it.
3. **Think - Pair - Share:** Let the points of one student be discussed with peer next to him / her (Pairing) and subsequently among small groups. Individual groups are then made to interact to arrive at the rational consensus, subsequently involving the whole class. Students are allowed to self assess; get peers' feedback against learning goal. It is highly effective in checking students' progress, their understanding and involvement. The response sheets are then collected individually and on group behaviour. It is now interesting and necessary as

well to see whether the students are visualizing the material as teacher had envisioned. May keep a record after due consolidation for marks scored by individual students or their grading as a measure of formative assessment.

One-minute feedback from students

To prepare for next sessions, it is useful to know student's learning in the session, they are now instructed to take out a sheet of blank paper for offering feed back on the topic discussed. They are requested to devote a minute to respond to few questions as mentioned under, within a minute and hand over the sheets collectively in an anonymous manner for evaluation later, as a feed back for the teacher as well as for HOD / IQAC cell for analysis and remodeling the teaching style appropriately, if required.

The answers to questions expected from students as feed-back be insisted in a structured format as under for easy analysis:

1. Here is what I learnt in today's lecture,
2. Here are some questions I still have,
3. Here are certain aspects that I didn't understand well enough to ask about,
4. Other comments or suggestions, if any.

Practice quiz / MCQ:

Students are now further tested to guide future learning through (MCQ paper/ Verbal/Clickers/Online). These are most effective when provided with response specific feedback. Most of the nice to know areas and several nice to know elements are covered to realize students' involvement and appreciation of the topic. It will be further desirable to request students to submit 3 to 5 MCQs on the topic next day to judge their in-depth knowledge, understanding and peer teaching skill,

besides motivating them to have a relook further details at home. Such MCQs are bound to enrich the institute question bank if stored selectively after due item analysis.

Feedback to students:

Feedback is ought to be bidirectional. On their performance on quiz, feedback is provided to students in relation to the pre-set learning objectives. It is better to create or find excellent performance examples to share with students. May not indicate a very correct response. It can be goal directed (e.g. skills related) or response directed (knowledge related). Feedback has to be specific, short, sweet, crisp, non-judgemental, with proper decorum, tactful, in descriptive terms, without offending anyone. To make the feedback more effective, address the topic, address the response, discuss particular errors, give realistic examples, provide subtle guidance and offer an opportunity for review by students. It is invaluable to motivate learners towards reaching the desired goal and ideal performance level. Effective feedback provides the learner both verification and elaboration. Verification confirms whether an answer is correct or incorrect whereas, elaboration explains as to why a particular answer is wrong.

The principles of good feedback practice are:

1. It clarifies as to what is a good performance,
2. facilitates self-assessment in learning by student,
3. Delivers quality information to students about the learning,
4. Encourages teacher and peer dialogue on learning,
5. Encourages positive motivation and self-esteem,
6. Provides opportunity to close gap between current and desired performance levels and
7. Provides information for teachers to improve teaching.

Case based learning:

In case of a clinical case based learning session, the teacher constructs a clinical case and its decision-making scenario. History, clinical findings, relevant laboratory results are constructed as a database. Students are now required to synthesize the material and arrive at the most appropriate diagnosis, individually or in groups. The discussion can be further carried forward in a continuum, suggesting additional clinical findings and diagnostic test reports as course in hospital or on follow-up to consider alternative differential diagnosis and line of management. Can be combined with 'Think-Pair-Share'/ QA sessions / Clicker modes as illustrated ante.

Skill training:

In the days of allegations all around about deteriorating medical training in India, enhanced emphasis must be assigned for rigorous training on medical soft skills to our products, whether private or

Government medical colleges. Insisting supervised learning efforts on 'Continuous evaluation on procedure skill (CEPS)' in FA and 'Directly observed procedural skill (DOPS)' in SA is the answer as competence is integral to clinical practice. Must acquire a range of core clinical skills and show evidence before given registration for practice independently. Results are shared between trainees in their skill logbook and supervisors in course of training and simultaneous formative assessment in form of CEPS. Minimum basic skills essential for good care are most important and demanding.

Ten mandatory skills at level-I so suggested by the GMC for the medical Graduate are: Application of a simple dressing, administering injections, examination of breast, cervical cytology, female and male genital examinations, prostate, rectal examination, testing for blood glucose and NG tube insertion. Few of these can be combined eg- Prostate with PR examination. In the level-II, 12 Additional procedures as evidence of clinical experience are desirable, may be during internship. These are: Aspiration of effusion in emergency, cauterization, cryotherapy, curettage, excision of skin lesions, incision and drainage of abscess, suturing of skin wound, obtaining skin surface specimens for mycology, joint and peri-articular injections, hormone implant placement, proctoscopy, and conducting normal delivery.

The medical institutes rigorously implementing this are bound to produce excellent doctors, releasing them to the community as their brand name. Due care of trainees must be ensured so that they keep cherishing their experience life-long and continue their relation with the parent institution through their alumni. Sir Richard Brown once said, "Train people well enough so that they can leave. Treat them well enough so that they don't want to".

Hesitations in implementing Formative Assessment and Myths Associated:

Whenever and wherever a new system, away from the convention is proposed, usually there is a resistance to change. Once the stakeholders familiarize themselves, they gradually feel comfortable, gradually adopting the system gracefully. Same thing had happened in the process of computerization in the recent past but today most of us are IT savvy. Only it demands a bit preparation prior to the session and most of us in any case are already used to it. The author has been taking teaching sessions now without much difficulty at either end. Rather several students have demanded such classes in their anonymous feedback. Few myths usually put forth against FA are dispelled with supportive evidence as under:

Myth 1. 'Formative assessment can not be scored': It certainly can be scored as explained earlier and cumulative marks during the course added together to accord 20% weightage in SA. Alternatively, students

can accumulate grades (ABC or in Likert's score 1-10) towards their final IA grade in a unit or whole course.

Myth 2. 'Formative assessment has no impact on learning or achievement': In fact, it has indeed a very positive impact! Studies show that strengthening FA produces significant learning gains and enhances lifelong learning skills by helping students to self-regulate learning. (Black and William, 1998; Nicol & McFarlane-Dick, 2006)^{2,3,4}

Myth3. Formative assessment consumes a lot of teaching time and effort: It does not if planned in advance! Rather it is considered a very productive investment. Studies shown FA often proved as very good teaching technique. If planned with QA sessions (Using clickers or online or self-study quiz in class itself), it does not consume time.

Myth 4. 'Formative assessments are merely MCQ Tests': Not really. Indeed, MCQ items can form the very bases for formative assessment. Providing students the opportunity to self-correct, self-study is an important element of FA. 'Taking up the test' is as essential as participating in the test.

Myth 5. Students won't accept formative assessment: In fact, it is more interesting for students. Motivation to learn actually increases when students see the gap between what they thought they knew and what they actually realized. Feedback can actually improve learning (Rushton, 2005).⁵

Summary

1. Assessment is an integral part of teaching-learning process, having two components, formative (FA) and summative (SA).
2. While summative assessment is a course-ending and qualifying examination, assessing mostly the cognitive domain in form of paper-pencil evaluation, FA is part and parcel of teaching process, continuously assessing all knowledge domains, including personal social attributes, with a bi-directional feedback.
3. Formative assessment prepares the profile of growth and development of every learner.
4. Formative assessment demystifies the evaluation process making it transparent, while taking students, their parents and the community as a whole into confidence.
5. Formative assessment communicates evaluation outcomes in a positive manner.
6. Formative assessment helps develop due competence and confidence for self-evaluation by students, keeping in view their maturity level.
7. Inclusion of formative assessment as a part of teaching-learning process demands an enabling environment, faculty and students' training, redefining the role for the Medical Education and Training (MET) cell organized at every institute.
8. Several issues those might compromise effectiveness of formative assessment such as -

faculty resistance, poor student motivation, paucity of commitment from regulatory authorities etc. need advance resolution in a win-win situation.

9. Evaluation of key qualities like regularity, punctuality, sense of duty, desire to serve, eagerness to accept responsibilities, compassion, empathy towards patients and accountability are important attributes; required to be reflected in evaluation for awarding additional credits and/or grades.
10. A participatory approach and a humane element is a must to be in place in the entire evaluation process.

Conclusion

Formative assessment is the process of appraising, judging or evaluating students' work or performance, in order to shape and improve their competence at large. Therefore it has been rightly said, "Without informative feedback on what they do, students will have relatively little, by which means to chart their development" (Yorke, 2003)⁶.

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