

Original Article

Effect of Online Formative Assessment Feedback on Learning Outcomes among Medical Under Graduates

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Background : Formative assessment provides learners with information that allows them to improve their learning and performance. Conducting Online feedback assessments can work as a time-effective alternative, for a large number of students and also help in providing timely feedback.

Objectives : To analyze the impact of Online formative assessment feedback on the academic performance among Undergraduate students.

Methods : This prospective and interventional study was undertaken on MBBS phase I students, age group (≥ 18 years) of Symbiosis Medical College for women using an Online LMS platform. Students were randomly divided into 2 groups so that the mean marks of both the groups are matched. A formative assessment was conducted with the intent to cover important topics for both the groups subsequently. A set of pre-validated quizzes were administered to the students from both groups; this was followed by an Online feedback session. The students were provided with feedback regarding their performance, based on the checklist prepared. A summative assessment was conducted at the end of the entire system and scores were analyzed in accordance with the marks obtained during online formative assessments.

Results : The Online formative assessment feedback method was well accepted by the students as well as faculty due to its feasibility. There was a significant improvement in the academic performance of the students Post formative assessment feedback sessions. Feedback clearly showed that more than 80% of the students found formative assessment as a comprehensive assessment tool, which helps them in identifying gaps in knowledge, also to test their knowledge more comprehensively and motivates them to work harder.

Conclusion : Online formative assessments have potential advantages for the students as well as for the teacher as they offer flexibility in terms of time and place. Formative assessment feedback will help the student to understand the expectations of the teacher along with identification of learning gaps. [J Indian Med Assoc 2023; 121(10): 37-41]

Key words : Assessment, Feedback, Formative, Online.

Formative assessment is crucial in guiding the learning process and has a powerful effect on learning outcomes as well as attitude towards learning¹⁻⁵. The newly implemented Competency Based Medical Education (CBME) is organized around competencies focusing on curricular outcomes, thus mandating assessment processes that are continuous, frequent, criterion-based and developmental³. Formative assessment is the assessment for learning and provides information that allows learners to improve learning and performance. In order to achieve this, FA needs to be included as a built-in component of curriculum¹⁵.

Conventional paper based assessments have several limitations attributed to the long process and logistics involved. They are associated with constraints to provide

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Editor's Comment :

Online Formative assessment feedback in medical education is crucial because it provides ongoing, constructive input to students as they progress in their learning. It helps students understand their strengths and weaknesses, enabling them to identify areas for improvement and adjust their study strategies accordingly. This timely feedback not only supports individual student growth but also contributes to the overall enhancement of the quality of medical education and ultimately leads to better-prepared healthcare professionals.

individualized feedback to the large number of students¹¹⁻¹². Online formative assessments have potential advantage of offering flexibility in terms of time and place and ability to provide immediate feedback to the student by the teacher. Learning can be further augmented by sharing study links and resources^{14,21}.

Evidence to support the educational benefits of online formative assessment feedback is relatively limited. Literature has contradictory reports showing that formative assessments do not improve the learning outcomes of students^{1,6,14}, whereas others demonstrating a positive effect on students' performance in summative examinations^{2,3,8,12,20}.

The unprecedented COVID-19 pandemic led to a crisis situation, has forced the medical colleges to cope by adopting digital mode and restructuring T-L and assessment methods. This methodology worked as a time effective alternative and also allowed conduct of FA for a large number of students. Continuation of hybrid mode of teaching and assessment is the need of the hour attributed to resurgence of COVID waves.

The present study was undertaken to understand the impact of Online formative assessment feedback for improving the academic performance during summative among Undergraduate medical students.

MATERIALS AND METHODS

Study setting : The study was undertaken in Symbiosis Medical College for Women using an Online Learning Management System (LMS) platform. Medical Undergraduates from phase I admitted during the academic year 2020-2021 were recruited for the present study.

Sampling technique : Convenient sampling technique where the entire class was the part of the ongoing process of formative assessment after each module.

Study Duration - 6 months

Type of study - Prospective interventional

Methodology :

The study was initiated after taking prior ethical clearance (SIU/IEC/264).

Faculty members from the Department of Physiology were trained by the departmental LMS coordinator in conducting Online formative assessment. They were also sensitized and trained for providing Online feedback which covered following points.

- (a) What was done well ?
- (b) What went wrong ?
- (c) Plan for further improvement.

Online formative assessments as quizzes were created, peer reviewed and validated by subject experts within the department who had more than five years of teaching experience. Each quiz consisted of 10 multiple choice questions (multiple choice, true or false and extended matching type) covering all levels of cognition namely, recall, comprehension, reasoning and application.

To calculate the reliability of the research tool which in our case was the feedback questionnaire, the method of test and retesting (Test - Retest) was adopted with a difference of a two-week time. Feedback questions were given to a group of 25 female students and the reliability coefficient was calculated which was 0.84.

Informed consent was obtained from all the participants. After first internal assessment

examination, based on the marks obtained; students were randomly divided into 2 groups ie, Group A and Group B, in such a way that the mean marks of both the groups were matched. Group A (n=71) and Group B (n=79). At the end of each important topic of Cardiovascular System and Respiratory System, formative assessments were conducted. A set of pre-validated quizzes were administered to the students from both groups, through a learning management system (MOODLE). Feedback was provided to a particular group of students by the allocated faculty after each formative assessment.

Summative assessment was conducted at the end of the entire system and scores were analyzed in comparison with the marks obtained during Online formative assessments.

After completion of summative assessment, students were provided with the following questionnaire and their responses were noted.

Questionnaire for assessing perceptions of students. (Closed ended questions for analysis on Likert scale)

(1) Does the given assessment test your knowledge for the module more comprehensively?

(2) Did the assessment help you in identifying gaps in knowledge?

(3) Will this assessment help you to analyze how much you need to read more for the given module?

(4) Do you feel that the formative assessment will help you to gain more knowledge for the given module?

(5) Does it motivate you to work hard?

Students were also given open ended questions asking them how and which ways did they find the feedback sessions helped in improving their academic performance.

Statistical Analysis : All characteristics were summarized descriptively. For continuous variables, the summary statistics of mean \pm Standard Deviation (SD) were used. For categorical data, the number and percentage were used in the data summaries and diagrammatic presentation. The difference of the means of analysis variables between two time points in same group was tested by paired 't' tests. Data were analyzed using SPSS software v.23 (IBM Statistics, Chicago, USA) and Microsoft Office 2007. p-value <0.05 , was considered to be statistically significant.

RESULTS

There was a statistically significant improvement in the academic performance of the students Post formative assessment feedback sessions during the internal assessment, especially the student who secured below average marks were benefitted by these

sessions (Tables 1&2). Feedback clearly showed that more than 70% of the students found formative assessment as a comprehensive assessment tool, which helps them in identifying gaps in knowledge, also to test their knowledge more comprehensively and motivate them to work harder (Table 3). Post internal assessment feedback session which was based on open ended responses showed that most of the students felt that feedback sessions were beneficial, useful, important, informative and helped them to identify the learning gaps (Table 4).

DISCUSSION

The present study tries to outline the method for providing Online formative feedback to a large cohort of students during phase I MBBS for Physiology subject. It is a time-effective alternative allowing to conduct formative assessment for a large number of students and also helps to provide timely feedback to the learner. Online formative assessment has received much less attention as compared with the conventional method of face-to-face mode and inadequate qualitative information is available on FA in higher education contexts¹⁸. Feedback can become a part of the learning cycle that will help the learner, the teacher, and even the teaching program^{19,20}.

The use of digital tools has made the process of giving and receiving feedback more accessible for learners³⁰. It has been reported that computer-mediated feedback in Online courses contributes to student learning⁴. Indeed, studies have shown that providing feedback increases retention of knowledge and results in improvement in final grades.

Several benefits of Online feedback provided to students upon completion of Online formative assessment have been reported. Use of technology helps in individualizing feedback which in turn facilitates learning by identifying the learning gaps¹. In addition, technology can be employed to analyze students' performance, keep track of their progress and modify

IA Marks	No of students	Percent
<33	0	0
33-60	13	8.7
60-75	125	83.3
75-100	12	8
Total	150	100

FA Marks	FA Marks (out of 100)		IA Marks		Mean p value change
	Mean	SD	Mean	SD	
<33	26.9	5.5	66.6	9.4	39.8 0.010*
33-60	49.4	5.6	66.1	6.0	16.7 <0.001*
60-75	63.8	4.3	67.2	8.0	3.3 0.013*
75-100	79.6	4.5	68.8	6.0	-10.8 <0.001*
Overall	60.0	13.9	67.0	6.8	7.1 <0.001*

Note : p value* significant at 5% level of significance (p<0.05)

method of teaching to meet the specific needs of students^{26,27}. Studies have shown that feedback received through online self-assessment²³ can enable learners to self-monitor their learning. It facilitates healthy communication between teacher and the student²⁰.

In order to maximize the benefit of FA, literature has provided suggestions for timing of submission of FA as well as feedback session. Studies have also shown that complex task performance will get benefited with a delayed feedback as it will ensure sufficient reflection time. In our study, we allowed the students to submit their responses within a time frame of 30 minutes to ensure that they will not read the study material during the quiz as it will be difficult for them to respond if they have not prepared. Few reports have suggested that, for improved academic performance timed assessments are useful, rather than untimed ones^{15,16}. It has been suggested that feedback should be inclusive of whether the performance was as per expectation, and should incorporate further information to enhance knowledge and corrective measures allowing improvement^{8,18,24}. The methods adopted in the present study not only ensured the convenient timely feedback but also ensured availability

Parameters	Disagree		Agree		Neutral		Strongly agree		Strongly disagree	
	N	%	N	%	N	%	N	%	N	%
Does the given assessment test your knowledge for the module more comprehensively?	0	0.0	107	72.3	10	6.8	31	20.9	0	0.0
Are you able to identify the gap in knowledge after the assessment?	1	0.7	93	62.8	9	6.1	45	30.4	0	0.0
Will this assessment help you to analyze how much you need to read more for the given module?	0	0.0	87	58.8	7	4.7	53	35.8	1	0.7
Do you feel that the formative assessment will help you to gain more knowledge for the given topics?	3	2.0	85	57.4	20	13.5	38	25.7	2	1.4
Does it motivate you to work hard?	2	1.4	88	59.5	8	5.4	50	33.8	0	0.0
Did formative assessment Feedback helped you for scoring more in the internal assessment ?	0	0.0	63	42.6	14	9.5	70	47.3	1	0.7

Table 4 — Themes derived from the responses obtained from students

- **Feedback sessions were beneficial for comprehensive learning.**
- Questions asked during the test were of wide range and covered all difficulty levels.
- The questions were interesting right from the basic concepts to the applied part of the topic.
- There were wide variety and range of questions in the test which covered the ABC of the topic.
- **Identification of learning gaps.**
- I could understand where I was lacking while writing the answers.
- It helped me to understand where I am lacking.
- Feedback session was very useful, never know what I got wrong in other exams so it's nice to know where I went wrong.”
- **Provided focus for learning.**
- Despite performing well, it showed me where I could improve, or where common mistakes were made to keep in mind for next time.
- This process made easy for me to understand my mistakes and also how to correct them.
- I could identify my mistakes and was guided by teacher regarding how to rectify them.
- The interaction with teacher helped me to understand where I actually went wrong.
- **Helpful expected level of knowledge.**
- Any type of feedback is always good. I also find this a benefit as this is my first exam during MBBS.
- You must know in terms of study, how in-depth one has to go to be prepared for the exam.
- Very helpful - good to know common errors and where I went wrong in exams.
- **Two was communication interactive nature was helpful.**
- This style of feedback should be implemented in all [courses].
- The feedback session is a good concept, especially when you have a class that is over 150 students you get a lot of benefit.
- This two-way communication between me and my teacher was very helpful.
- This process of exam is super cool as it also takes an accountability of my inputs.
- Teacher asked about my comments and inputs regarding the exam which is really good.
- It was non-threatening as teacher was explaining us how to improve.
- The feedback session was very nice as teachers were explaining us where we went wrong in a non-threatening manner.
- **Helped to prepare plan of action.**
- This process made easy for me to understand my mistakes and also how to correct them.
- I could identify my mistakes and was guided by teacher regarding how to rectify them.
- The feedback sessions helped me to understand the road ahead for planning my studies.
- Feedback helped me to plan the way I study
- I could plan my studies well after receiving the feedback.

of an adequate time to reflect on what and how things went wrong and how they can be corrected by feedback mechanism¹⁷.

In this study, students were informed regarding the topics which needs to be emphasized and also the topics which will need in-depth preparation. Studies have suggested that formative assessment can deeply affect students; so feedback should be provided in a manner that encourages positive motivational beliefs and self-esteem¹⁹. A good verbal and non-verbal communication skill will have a positive motivational impact on students. A proper voice tone, body language of a teacher and active listening will help in escalating the dialogue between the teacher and the learner. In the present study, the students described the feedback session as useful, informative, interactive and non-threatening which is in alignment with earlier studies recommending the feedback to be an interactive dialogue, not a monologue^{12,13}. It should be personalized, not generalized. It has been suggested that discussion between learner and facilitator in a language easily understood will encourage students to elaborate their issues and concerns²⁵. The feedback method of the present study did aim to provide more personalized feedback to a large cohort of students through Online platform which thoroughly ensures

maintaining confidentiality, and privacy. The recommendation provided by Craig and Glover that feedback should be interactive, a dialogue, not a monologue, personalized, not generalized and presented in easy-to-understand language⁵. He also added that the feedback should not be the final process of learning during a task; instead, it must be a springboard toward improving future assessments, aptly referred to as feedforward². This was corroborated by Kerridge who suggested that encouraging discussion between learner and facilitator will allow the students to elaborate their issues and concerns in a language that is accessible and readily understood, which may be achieved using the method described in the present study¹⁴. A study conducted by Price, *et al* identified difficulties of accurately measuring the aspects of feedback that truly influence the learner and the learning process in a meaningful and lasting manner¹⁶.

We would also like to elaborate the additional benefits of using the digital platform for FA. Use of technology allows easy access to assignments using individual password reducing administrative load of manual correction and evaluation of assessment of answer sheets.

It can facilitate student engagement, bilateral discussion and helps to discover and respond to

underlying misconceptions.

Limitations :

- This method was only adopted for one term, so there is a need to explore its feasibility and sustainability of the process.

- There is a question of feasibility with respect to training of faculty for using technology, availability of robust LMS system and institutional support.

- As this process was conducted for only one system, reliability needs to be proved.

Future directives :

We propose that this tool should be applied for all systems in Physiology and can be introduced at institutional level.

CONCLUSION

The present study proposed a method of providing timely formative feedback to a large cohort of first-year Physiology class in a manner that achieved.

The Online formative assessment feedback method was well accepted by the students as well as faculty who perceived the technique to be feasible and flexible in terms of time and place.

It was perceived by the students that formative feedback was helpful in comprehensive learning with identification of gaps and improved learning outcomes. There was an improvement in students' performance in summative assessment, implying a positive academic impact.

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