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Original article:

Effectiveness of formative assessment in improving the learning process among medical students

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Abstract:

Continuous formative assessment (FA) will make the student to actively participate during learning process, recognize his learning skills and motivate him. This study aims to find whether multiple formative assessments will improve summative assessment (SA) score among students and to assess student's perception towards formative assessments. This is a quasi-experimental study conducted among 60 students of first year MBBS of Malabar Medical College. They were divided into two groups, A and B of 30 students each. At the end of 8 weeks, Group A and Group B underwent a written test and oral assessment .The differences in mean marks scores were analyzed and compared. There was a significant improvement in SA score of students in group A. Formative assessment may be used to enhance student learning and if used throughout the course will help the students to retain knowledge which will improve their performance in summative assessments

Keywords : Formative assessment, summative assessment, learning skills

Introduction:

Formative assessment is based on three objectives, viz: identification of gap in student learning, motivation for learning and providing feedback information for the benefit of students. FA throughout the course will help the students to retain knowledge which will improve their performance in summative assessments [1].Faculty in medical colleges are engrossed in standards that reap scholastic success and facilitate learning [2,3].Therefore, it has become common for faculty to supplement traditional summative exams with formative tests [4,5].While summative exams evaluate student knowledge or task performance at the end of instructional segments, FA provide students with feedback about how they are doing along the way[6,7]. Despite their wide use, the value of formative exams remains unclear. Haberyan [8], Brothen and Wambach[9]reported that formative assessments did not enhance overall learning outcomes, while McDonald[7]and Buchanan[10] reported significant improvements. Therefore, this study is conducted to evaluate the possible benefits of formative assessments compared to summative assessment in medical education.

Materials and Methods:

This is a quasi-experimental study. It was conducted on first year MBBS students in Malabar Medical College, Kozhikode for a period of two months (May and June 2016). Inclusion criteria were first year MBBS students willing to participate in the study. Exclusion criteria were first year MBBS students who are absent on the day of distribution of consent form. The sample size was 60.They were distributed into two groups, Group A of 30 students

undergoing formative assessment (FA) and Group B of 30 students undergoing summative assessment (SA).They were divided into study and control group based on convenient sampling method. Ethical clearance was obtained from institute's ethics committee. A written informed consent was taken from all the students willing to participate in the study. There was no disclosure of student's identity at any point of research work. Group A underwent weekly FA for two months. A total of 7 FA was done on Group A. Table 2 shows the details of each type of assessment for a period of 8 weeks. At the end of 8 weeks, Group A and Group B underwent a written test (2hrs) and oral assessment (each student ten minutes). The study group had an orientation class regarding the project work. The project was also discussed with department colleagues to take their input.

The study group underwent formative assessment at the end of every week for eight weeks between May-June 2016.At the start of each week, the topics for assessment were discussed with the study group and handouts were distributed for the same. The performance of the students was assessed by other staff members of the department. At the end of eight week, both study group and control group underwent summative assessment of theory for two hours which had case based questions, short essays, labeling of diagrams and physiological basis questions. This was followed by viva voce for study and control group for ten minutes. The differences in mean marks scored by two groups were analyzed and compared.A feedback was then taken from students study group using a peer reviewed questionnaire. Table 6 in annexure has the list of questionnaires given to students after the completion of assessment programmes. It is based on Likert five point scale. The mean marks obtained during 7 FA and SA was statistically analyzed by unpaired t test. The feedback response of students was tabulated. The SPSS software program version 20 was used in the analysis of the data. P-value <0.05 was considered as significant. Feedback response was analyzed using the Fisher exact test and Pearson chi square test for dependent proportions.

Results:

A total of 60 students participated in this study. Demographic data are summarized in Table 1. In our sample, there was almost equal distribution of male and female
students in study and control group.

Table1: Demographic data of study and control group.

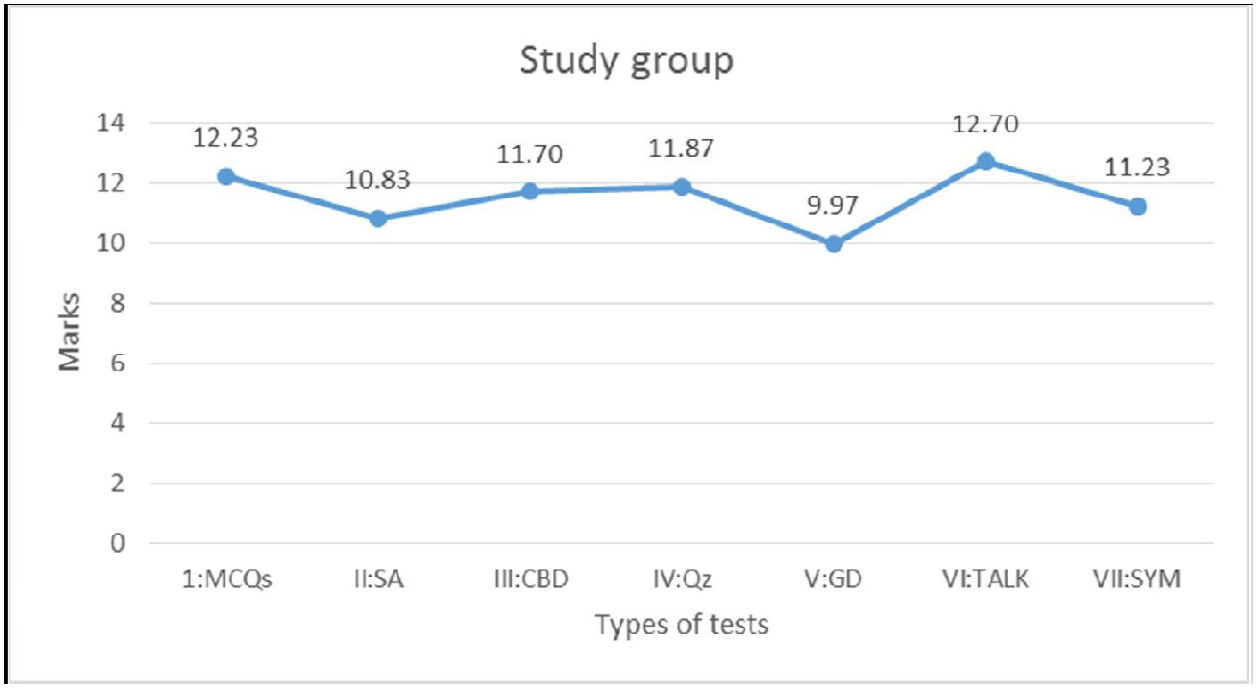
Groups	Males	Females
Study	16	14
Control	15	15

Table 2 shows the details of each type of assessment for a period of 8weeks and
Graph 1 shows the assessment scores of formative assessment I to VII of study
Group

Table 2: Details of formative assessment used during the study period

Weeks	Method of assessment
1	MCQs
2	Short answers
3	Case based discussions
4	Power point based quiz
5	Group discussion
6	Pick a lot and talk
7	Symposium

Graph1: Mean assessment score of study group FA I to FA VII



The capacity to predict total summative score from total formative scores (sum of all 7 formative assessment) was evaluated by multiple linear regression test. Total formative assessment scores were found to be statistically significant predictors of summative score, as shown in Table 4.

Table 4: Multiple regression test

	Beta	Sig	Lower bound	Upper bound
Constant		.001	2.444	7.671
FA I	.075	.673	-.182	.277
FA II	-.193	.393	-.466	.190
FAIII	.337	.110	-.056	.510
FA IV	-.130	.399	-.367	.152
FA V	.119	.373	-.138	.354
FA VI	.741	.002	.298	1.127
FA VII	.017	.879	-.200	.232

Unpaired t test demonstrated statistically significant difference in total summative scores between study and control group (Table 5).

Table 5: Total summative scores of study group and control group

	Mean	N	Std. Deviation	Std. Error Mean
Control VIII test	12.6333	30	4.49124	.81999
Study VIII test	15.8333	30	4.11124	.75061
ControlViva	14.5000	30	4.09162	.74702
StudyViva	17.3667	30	3.89945	.71194

	Sig. (2-tailed)
Control VIII Vs Study VIII	0.009
Control Viva Vs StudyViva	0.005

Feedback questionnaire was distributed at the end of project among study group (Table 6) which was analyzed by Fischer exact test and Pearson chi square test. Table 7 and Graph 2 show the significance.

Table 6: Peer reviewed feedback questionnaire

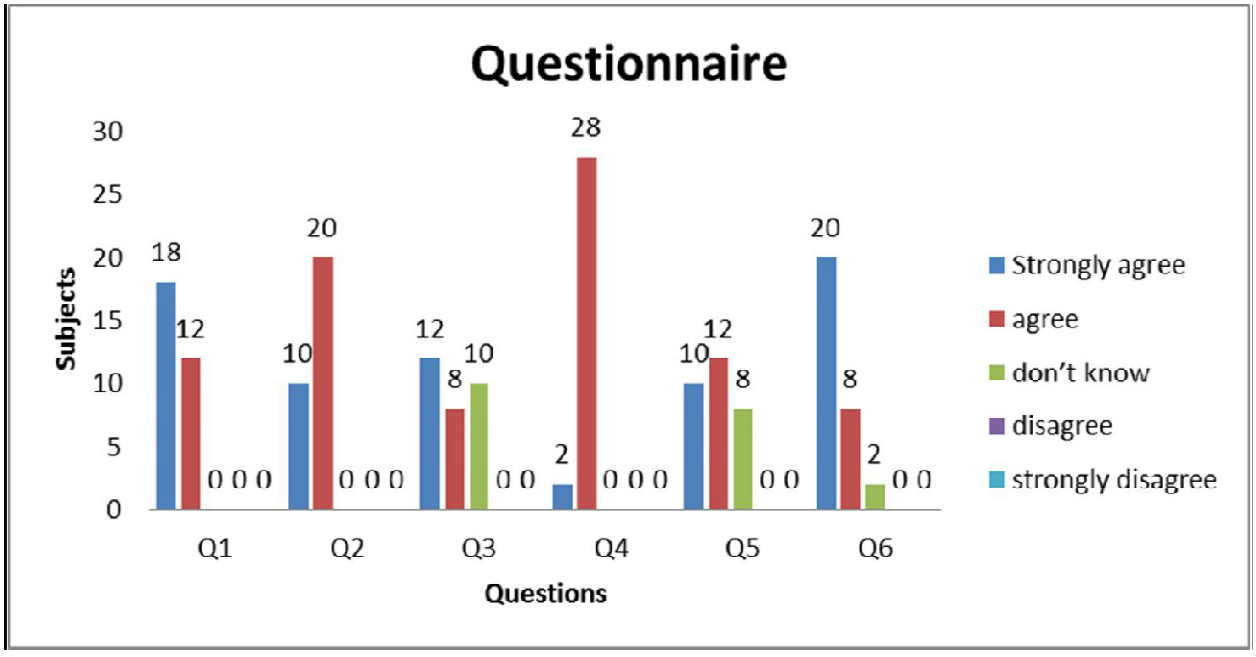
Serial no.	questions	Strongly agree	Agree	Don't know	Disagree	Strongly disagree
1.	Will FA suitable in learning Physiology?					
2	Will FA motivate you in learning process?					
3	Does it increase the self					

	confidence in you?					
4	Does FA reduce stress level during SA?					
5	Are you able to perform well in SA?					
6	Do you want it to be included in other subjects too?					

Table 7: Fischer exact test and Pearson chi square test for feedback questionnaire

Questionnaire	Pearson chi square test p value(2 tail sig)	Fischer exact test p value(2 tail sig)
Q1 vs Q2	0.002	0.002
Q1 vs Q3	0.001	0.001
Q1 vs Q4	0.232	0.503
Q1 vs Q5	0.001	0.002
Q1 vs Q6	0.001	0.001

Graph 2: Response to feedback questionnaire



Discussion:

The primary purpose of this study was to determine if the use of formative assessments would improve performance in subsequent summative exam. Researchers have reported that formative assessments enhance summative exam performance in dental students, medical students and a variety of undergraduate majors. However, other investigators have reported that formative assessments do not enhance summative exam scores. Our study results supported the notion that FA will improve performance on subsequent written and viva voce summative exams. The study group had significantly higher summative exam scores than control group. Several studies have suggested that formative assessments can predict summative exam outcomes. Our study results supported this conclusion. Total FA scores were significant predictors of written summative exam scores. As summative assessment only takes place once a term, it cannot provide useful information for teachers on the subject areas that students find difficult or have experienced difficulties with. Interestingly, aligning summative assessment with formative could contribute to the comprehensibility and validity of the assessing process as well as improves student's learning since the students are exposed to a variety of assessment techniques. Formative assessment can have positive impacts on boosting student's egos and motivation to learn. In addition, it can also lead to change in teaching methodology and modify them to cope with their student's current level. Finally, formative assessment appears to be a very influential learning tool when it is utilized appropriately. However, the guarantee of providing an effective formative assessment is based on several factors, such as class size, teaching load, nature of assessment and student's enthusiasm and motivation.

Conclusion:

We conclude that formative assessment may be used to enhance student learning and also serves to identify students who, without additional remediation, will perform poorly on subsequent summative written exams. Moreover, an extensive education literature suggests that the beneficial effects of active learning through multiple formative assessments are quite durable, lasting months or even years. However more studies are required to confirm this hypothesis.

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