

Correlation between Formative and Summative Assessment Results by Post Validation in Medical Undergraduates

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Abstract

Background: Assessments are done to help students during learning and to evaluate what they have learned at a particular point of time. They form the basis for formative and summative assessment. Formative assessment assists in learning hence called 'Assessment for Learning'. It involves activities attempting to assess where they are in their learning process and utilize the information available for use by students and their teachers to determine what is to be done for betterment. Summative assessment is used to evaluate what has been learned at a particular time hence called 'Assessment of Learning'. It involves activities like evaluating learning over a period of time and ascertaining it by testing at a particular time. Data from assessment can be utilized for comparing aggregated results of groups or populations.

Aims and objectives: To study the efficacy of formative assessment with additional assessment methodologies, in changing the results of summative assessment, then to compare the results of the study population with that of the previous year students without additional intervention and to assess the feedback perceived by students on formative assessment, qualitatively.

Materials and methods: Prospective interventional study done in a Government Medical College, South Tamil Nadu, for a period of three years. Students who wrote Pathology University examination in February 2018 and February 2019 formed the study population. In addition to record work and internal assessment exams both theory and practical, assessment methodologies like symposiums, home assignments, gross assignments, histopathology/cytology projects and day to day assessments were conducted on topics covered during the study period for the study population. The efficacy of formative assessment with additional assessment methods, in changing the results of summative assessment were assessed. Summative assessment marks of both the batches were compared with that of the previous year students without additional interventions who wrote University examination in February 2017. Data were analysed using SPSS16. Correlation was done to assess the efficacy of formative assessment and compared using Unpaired t-test. Feedback of student's perception on formative assessment were collected from the study population and validated qualitatively using a structured questionnaire at the end of course before university exam, after university exam and after university exam results.

Results and conclusion: A positive correlation was seen between the marks scored in formative and summative assessment. The average scores of the study population with additional intervention (101.48 ± 10.53 and 99.87 ± 10.49) was better than that of the previous year students without additional intervention (94.41 ± 12.14) and it was statistically significant. Majority of them opined that formative assessment helped them to achieve better scores. In conclusion, both formative and summative assessments are necessary tools in learning process and the importance of formative assessment lies in the evidence of its effectiveness in improving the results of summative assessment as perceived by the students which differs from batch to batch. A well structured formative assessment with additional interventional methodologies are needed to help medical undergraduates in learning.

Keywords: formative assessment, summative assessment, feedback, efficacy, learning, perception

Date of Submission: 28-08-2021

Date of Acceptance: 12-09-2021

I. Introduction

Assessments are done to help students during learning and to evaluate what they have learned at a particular point of time. They form the basis for formative and summative assessment. Formative assessment assists in learning hence called 'Assessment for Learning'. It involves activities attempting to assess where they

are in their learning process and utilize the information available for use by students and their teachers to determine what is to be done for betterment¹. Formative assessment is an informal evaluation done throughout the course of study, as a fundamental part of the learning process. Summative assessment is used to evaluate what has been learned at a particular time hence called 'Assessment of Learning'. It involves activities like evaluating learning over a period of time and ascertaining it by testing at a particular time². It is a formal process that analyses the efficiency, understanding and overall performance of the learners at the end of a course. Data from assessment can be utilized for comparing aggregated results of groups or populations. In this study an attempt was made, to study the efficacy of formative assessment with additional assessment methods in changing the results of summative assessment and the results of the study population was compared with the previous year's corresponding batch of students. Later the feedback on formative assessment as perceived by students were assessed qualitatively.

II. Materials And Methods

This prospective interventional study was done in the Department of Pathology, Kanyakumari Government Medical College, Tamil Nadu from October 2016 to September 2019, over a period of three years. A total of 293 students were included in the study. Second year medical undergraduates of 2015 admission, named as A batch and students of 2016 admission, named as B batch formed the study population. Symposium, home assignment, gross assignment, histopathology/cytology project and day to day assessment were conducted on topics covered during the study period of one and half years in second year MBBS course for both A and B batch in addition to routine record work and internal assessment exams both theory and practicals. Efficacy of formative assessment with additional intervention in changing the results of summative assessment were assessed. Summative assessment marks of A batch and B batch were compared with that of the previous year students without additional interventions, who wrote University examination in February 2017, named as C batch. Data were analysed using SPSS software version 16 (SPSS Inc, Chicago, USA). Descriptive data were expressed using frequency and percentages. Pearson's correlation and it's statistical significance was calculated to find the relation of formative assessment marks with that of summative assessment. The significance of the outcome of assessment of study population was compared with that of C batch using Unpaired t-tests. A structured questionnaire was prepared by the investigators to collect student's perception regarding additional formative assessment methodology at the end of the course before university exam, after university exam and after university exam results from both the batches and was collected and validated qualitatively.

III. Observation And Results

A total of 196 students (97 from A batch and 99 from B batch) participated in this study and C batch had 97 students. On correlating the marks of formative assessment with additional interventions, with that of university marks the pearson's correlation coefficient of A batch and B batch was 0.69 and 0.65 respectively with $p < 0.001$ for both the batches. The overall average marks of internal assessment of A batch and B batch with additional intervention were 17.41 ± 2.92 and 17.61 ± 2.83 (out of 30 marks) respectively whereas that of C batch without intervention was 15.34 ± 2.85 (out of 30 marks). Scatter plot correlating the marks of internal assessment (y-axis) with that of university marks (x-axis) of all 3 batches are depicted in Figure 1,2 and 3.

Figure 1: Scatter plot for internal and summative assessment of A batch.

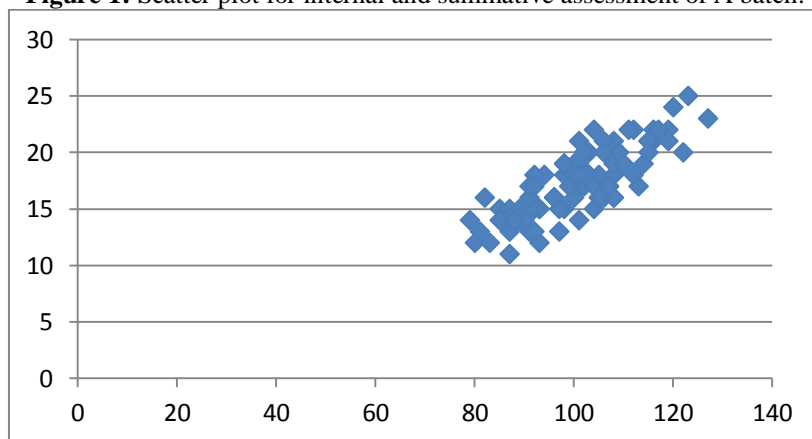


Figure 2: Scatter plot for internal and summative assessment of B batch.

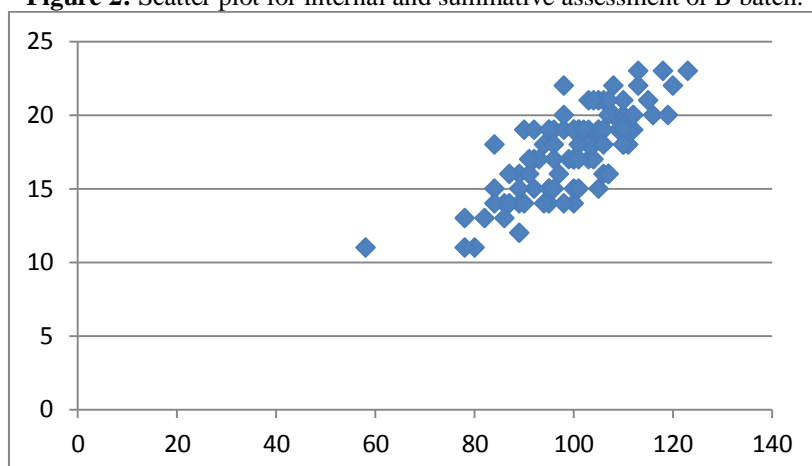
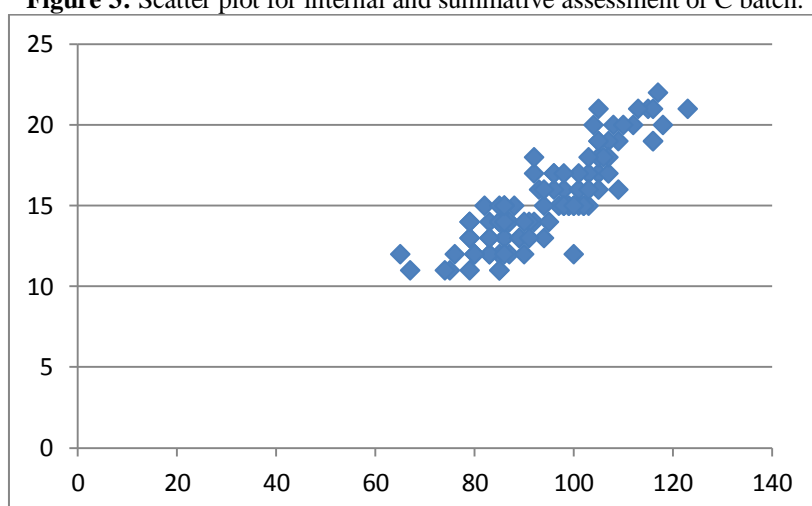


Figure 3: Scatter plot for internal and summative assessment of C batch.



The average university exam marks (out of 150) of A batch (101.48 ± 10.53) and B batch (99.87 ± 10.49) was higher when compared to that of previous year students (94.41 ± 12.14) and was statistically significant ($p < 0.001$) as shown in Figure 4.

Figure 4: University exam Pathology marks of Interventional (A batch and B batch) versus Non interventional group (C batch).

Batch	University exam marks	University exam marks of C batch	p value
A	101.48 ± 10.53	94.41 ± 12.14	1.18435E-05
B	99.87 ± 10.49	94.41 ± 12.14	0.000456

Feedback on formative assessment was obtained from both A batch and B batch students and validated as shown in Figure 5 and 6 respectively, at the end of course before university exam, after university exam and after university exam results. The number of students who completed the feedback questionnaire varied with response rate ranging from 85% to 100%.

Figure 5: “A batch” students feedback on formative assessment.

Do you think the following formative assessment will help/helped you in University examination to score marks	Yes	Not sure	No	
Symposium	59%	31%	10%	Pre university exam
	60%	25%	15%	Post university exam
	79%	21%	0%	Post exam results
Home assignment	67%	4%	29%	Pre university exam
	51%	19%	30%	Post university exam
	60%	13%	27%	Post exam results

Gross assignment	42% 75% 55%	47% 20% 32%	11% 5% 13%	Pre university exam Post university exam Post exam results
Histopathology/ Cytology projects	60% 54% 70%	34% 36% 19%	6% 10% 11%	Pre university exam Post university exam Post exam results
Day to day assessment	68% 58% 60%	23% 34% 31%	9% 8% 9%	Pre university exam Post university exam Post exam results

Majority opined that symposium helped them to think and study (59%) and many felt it helped them to get rid of stage fear alone (31%) in pre university exam feedback. Many felt it was useful for exam preparation and boosts confidence in viva voce during post university exam feedback. 21% to 25% of students were not sure about the usefulness of symposium in post university exam and post exam results feedback, maybe because of their perception as to get rid of stage fear alone. In post exam results feedback, 79% of them opined that it helped in better understanding of the subject and was like a revision for university examination.

Most of the students (73%) accepted copying home assignments given to them during the study period out of which 44% copied from textbook and 29% of students copied from friends. Only 23% referred books and acquired knowledge in pre university exam feedback. In post university examination feedback more than half of the batch (51%) felt that home assignments were useful, maybe because part of students who copied from textbooks realized that it made them learn and majority opined it helped to revise and recall during exams, but still 19% were not sure of its value. About 30% felt it was not useful, which correlates with the percentage of students who copied from friends (29%). Even in post exam results feedback, 27% of them were of the same opinion.

Regarding gross assignments 47% of the students suggested that they did it to get internal marks alone and 42% felt it helped them to understand and correlate the pathogenesis and morphological features with clinical features in pre university examination feedback. In post university examination feedback, 75% felt it was helpful and useful, maybe because part of the students who did it sincerely with clarity, logical and scientific approach with creativity, even if it is for the sake of internal marks valued it later. 32% of students had no idea about the role of gross assignments in post exam results feedback, which could be due to lack of perception of its usefulness and approach while doing it for the sake of completion.

In pre university examination feedback nearly 60% of the students commented that histopathology/cytology projects helped them to understand and correlate the pathogenesis and morphological features with clinical features and 34% opined that they did it to get internal marks alone. Completing the project work for the sake of marks alone without knowing the applied aspect of case based studies has left 36% and 19% of them, without any idea of its use in post university examination and post exam results feedback respectively. This maybe in part due to the students not actively participating in the exercise given and also maybe due to the faculties not instigating much on the practical approach to the case based studies within all the students.

Majority of the students, around 58% - 68% valued day to day assessment and suggested it made them to listen to lectures, understand subject and read regularly. 23% - 34% of students did not bother and had no idea of its importance which maybe partly due to the attitude of students and other part maybe due to the teachers not arousing much curiosity within all the students.

Figure 6: “B batch” students feedback on formative assessment.

Do you think the following formative assessment will help/helped you in University examination to score marks	Yes	Not sure	No	
Symposium	49% 65% 64%	25% 10% 12%	26% 25% 24%	Pre university exam Post university exam Post exam results
Home assignment	54% 50% 56%	14% 16% 13%	32% 34% 31%	Pre university exam Post university exam Post exam results
Gross assignment	28% 77% 76%	65% 15% 14%	7% 8% 10%	Pre university exam Post university exam Post exam results
Histopathology/ Cytology projects	68% 67% 73%	28% 24% 20%	4% 9% 7%	Pre university exam Post university exam Post exam results
Day to day assessment	62% 67% 63%	32% 28% 29%	6% 5% 8%	Pre university exam Post university exam Post exam results

Only half of the batch (49%) felt symposium helped them to think and study and 25% of them felt it helped them to get rid of stage fear alone in pre university exam feedback. Majority (65%) felt it was useful for exam preparation and boosts confidence in viva voce in post university examination feedback, maybe because a part of the students who felt it helped them to get rid of stage fear later realized it also helped in learning. 10% of students were not sure about the usefulness of symposium for their exams, maybe because of their perception as to get rid of stage fear alone. In post exam results feedback 64% of them opined that it helped in better understanding of the subject and was like a revision for university examination. Around 25% of students remained the same in their opinion that symposium was of no use for exams which maybe in part by the students who were not ready for exam preparation well in advance and the other part played by scheduling it well before 6 months for University exam.

More than half of the batch (58%) accepted copying home assignments given to them during the study period out of which 26% copied from textbook and 32% of students copied from friends. Only 28% referred books and acquired knowledge in pre university exam feedback. In post university examination feedback half of the batch (50%) felt that home assignments were useful, maybe because part of students who copied from textbooks realized that it made them learn and majority opined it helped to revise and recall during exams, but still 16% were not sure of its value. About 34% felt it not useful, which correlates with the percentage of students who copied from friends (32%). Even in post exam results feedback 31% of them were of the same opinion.

Regarding gross assignments 65% of the students suggested that they did it to get internal marks alone and only 28% felt it helped them to understand and correlate the pathogenesis and morphological features with clinical features in pre university examination feedback. In post university examination feedback majority of the students (77%) felt it was helpful and useful, maybe because part of the students who did it sincerely with clarity, logical and scientific approach with creativity, even if it is for the sake of internal marks valued it later. 14% of students had no idea about the role of gross assignments in post exam results feedback, which could be due to lack of perception of its usefulness and approach while doing it for the sake of completion.

In pre university examination feedback 68% of the students commented that histopathology/cytology projects helped them to understand and correlate the pathogenesis and morphological features with clinical features and 28% opined that they did it to get internal marks alone. Completing the project work for the sake of marks alone without knowing the applied aspect of case based studies has left 24% and 20% of them, without any idea of its use in post university examination and post exam results feedback respectively. This maybe in part due to the students not actively participating in the exercise given and also maybe due to the faculties not instigating much on the practical approach to the case based studies within all the students.

Majority of the students, around 62% - 67% valued day to day assessment and suggested it made them to listen to lectures, understand subject and read regularly. 28% - 32% of students did not bother and had no idea of its importance which maybe partly due to the attitude of students and other part maybe due to the teachers not arousing much curiosity within all the students.

IV. Discussion

Formative assessment is intended to have a direct impact on learning as it takes place. It permits the teachers to keep a check on the learning process of students, both as a individual and as a batch. Clearly the collection of evidence about performance in relation to all relevant understanding and competences is the most important part of the process, for without it the final report on achievement is unlikely to provide dependable information about students' achievement of the goals of learning. The significance of formative assessment lies in the affirmation of its efficacy in improving the results of summative assessment and its impact can be quantified³. Considerable improvement occurs with the use of formative assessment in the learning process³. Final results can be predicted by active involvement in formative assessment⁴. The progress made by the students can be checked using formative assessment and thus helping in improvement of learning process and competent doctors are produced⁵.

Traditionally most common format of formative assessment in medical undergraduates are internal assessment tests and record work given at frequent interval during the study period. Good quality assessment has become a major challenge within medical education⁶. It can be merged with seminars, assignments, case based discussions and assessment of individual performance on daily basis using multiple techniques like question session in the middle of lectures, quiz⁷. In our study additional interventions like symposium, home assignment, gross assignment, histopathology/cytology project and day to day assessment were introduced as part of formative assessment in the study population. Positive correlation was seen between formative and summative assessment and the study population scored better mean scores than the previous year's main batch without additional intervention and was statistically significant. Kala Parvathy Kesavan et al. also found statistically significant positive correlation between formative and summative assessment and affirmed that

mean scores of summative assessment of the intervention group (monthly tests) was higher than non intervention group in their study⁸.

Feedback has tremendous impact on learning and accomplishment of students^(9,10). Feedback on perceived usefulness of formative assessment showed majority of the study population with the opinion that additional interventions do help for university examination and many valued it later after the examination and the results. Around 21% to 24% of students in B batch remained the same in their opinion that symposium was of no use for exams which maybe in part by the students who were not ready for exam preparation well in advance. Palmer E et al. states that since formative assessment does not directly contribute to final grade, lack of sincerity among learners can be a challenge to assessors¹¹. Scheduling it well before 6 months for university examination may also be the reason. Interference with independent study habits can hinder the students from backing away from preparation for formative assessments⁸. Hence if scheduled in the last 2 months before university exam, symposiums might be much useful for the remaining students too.

Regarding home assignments, 27% to 34% of the study population were of the opinion that it didn't help for exam which correlated with the percentage of students who copied from friends in both the batches. Hence it can be affirmed that copying assignments for the sake completion won't help in university examination. Gross assignments were opined to be of not much use before examination but later the importance was understood after university exam maybe because part of the students who did it sincerely with clarity, logical and scientific approach with creativity, even if it is for the sake of internal marks valued the knowledge gained by doing so later in examination. Alsalhanie KM et al. concluded in their study that self regulated deep learning aided in achieving better results in summative assessment in 80% of their participants¹². Gross pathology are naked eye manifestations seen due to molecular and microscopic changes within the tissue/organ. Hence doing these assignments without insight into the subject has left 14% to 32% of students without any idea of its use even after exam results.

Around 19% to 36% of students had no clue about the role of histopathology and cytology projects in university examination even after examination and results. This maybe in part due to the students not actively participating in the exercise given and also maybe due to the faculties not instigating much on the practical approach to the case based studies within all the students. Labarca et al. found improvement in academic performance of 90% of students who actively participated in formative assessment¹³. Hence active participation of students with proper guidance may help them value the importance of case based discussion in future. 23% to 34% of students did not bother and had no idea about the importance of day to day assessment which maybe partly due to the attitude of students and other part maybe due to the teachers not arousing much curiosity within all the students. Assessment methodology which are stimulating, motivating and entertaining are preferred more by the students^(14,15). Hence more creative methods like word puzzles, picture based questions, multiple choice questions can be tried in future to engage them actively during lecture hours for day to day assessment. An assessment can be thought formative only if it elicits action from both the students and teacher thus, finally enhancing learning¹⁶.

V. Conclusion

Formative and summative assessments are necessary tools in every educational system because through them administrative decisions such as ability streaming, selection and certification are taken. The importance of formative assessment lies in the evidence of its effectiveness in improving the results of summative assessment as perceived by the students which differs from batch to batch. A well structured formative assessment is needed to improve learning. Newer additional interventional methodology of formative assessment has been seen to be significantly improving the performance of two consecutive batches. Hence these methods can be integrated into the curriculum and linked to learning objectives for medical undergraduates.

References

- [1]. Crossouard (2012) Absent presences: the recognition of social class and gender dimensions within peer assessment interactions. *British Educational Research Journal*, 38 (5) 731-748.
- [2]. Linn, R. L. (2000) Assessments and accountability. *Educational Researcher*, 29 (2) 4-16.
- [3]. Black, P. and Wiliam, D. (2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability*, 21 (1). 5-13.
- [4]. Carillo-de-la-Pena MT, Bailles E, Caseras X, Martinez A, Ortet G, Perez J. Formative assessment and academic achievement in pre-graduate students of health sciences. *Adv Health SciEduc Theory Pract*. 2009;14(1):61-67.
- [5]. Cauley K, McMilan J. Formative techniques to support student motivation and achievement. *The Clearing House*. 2010;83(1):1-6.
- [6]. Reinert A. 2017. Assessment in Medical Education: A primer methodology. *Perspective*. 2013;25-34 [Cited 2017, June 28].
- [7]. Office of Health Sciences Education. Improve learning through Formative assessment .*The Teaching Doctor illuminating evidence based ideas for effective teaching* .2008.Pp. 1-8 [Cited 2017 June 30].
- [8]. Kala Parvathy Kesavan and Dhanya Sasidharan Palappallil. Effectiveness of Formative assessment in Motivating and Improving the Outcome of Summative Assessment in Pharmacology for Medical Undergraduates. *Journal of Clinical and Diagnostic Research*. 2018 May, Vol-12(5)FC08-FC11.
- [9]. Rushton A. Formative assessment: a key to deep learning? *Med Teach*. 2005;27(6):509-13.

- [10]. Palappallil DS. Attitude of interns and students on teaching and learning methodologies in pharmacology. *International Journal of Pharmacology and Therapeutics*.2015;(1):1-7[Cited 2017 June].
- [11]. Palmer E, Devitt P. Limitations of student – driven formative assessment in a clinical clerkship. A randomized controlled trial. *BMC Med Educ*.2008;8:29.
- [12]. Alsalhanie KM, Das S, Abdus –Samad S. Formative evaluation impacting the results of summative evaluation – a feedback based cross sectional study carried out among instructors of an international medical school. *Int J Res Med Sci*.2017;5(7):2865-69.
- [13]. Labarca J, Figueroa C, Huidobro B, Wright AC, Riquelme A, Moreno R. Perception of medical students about formative assessments during clinical courses. *Rev Med Chil*. 2014;142(9):1193-99.
- [14]. Harlen W, James M. Assessment and learning: differences and relationships between formative and summative assessment. *Assessment in Education:Principles, Policy and Practice*. 1997;4(3):365-79.
- [15]. Hudson JN, Bristow DR. Formative assessment can be fun as well as educational. *Adv Physiol Educ*. 2006;30(1):33-37.
- [16]. Bell B, Cowie B. The characteristics of formative assessment in science education. *Sci Ed* 2001;85:536-53.

Dr.Leo David.P, et. al. "Correlation between Formative and Summative Assessment Results by Post Validation in Medical Undergraduates." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(09), 2021, pp. 51-57.