

## Original Research Article

### Effectiveness of Internal Examinations in Predicting Student's Performance in Final University Examination: A Retrospective Study

Adwait Godse<sup>1</sup>, Amey Paranjape<sup>2</sup>, Geeta Hegde<sup>3</sup>, Mandar Chandrachood<sup>4\*</sup>, Pranjal Dharwadkar<sup>5</sup>

Departments of <sup>1</sup>Physiology and <sup>2</sup>Respiratory Medicine, BKL Walawalkar Rural Medical College and Hospital, Sawarde, Ratnagiri, Maharashtra.

<sup>3</sup>Department of Physiology, Rajiv Gandhi Medical College and Hospital, Kalwa, Thane, Maharashtra.

<sup>4</sup>Department of Community Medicine, Jawaharlal Nehru Medical College, Datta Meghe Institute of Higher Education and Research, Wardha, Maharashtra.

<sup>5</sup>Department of Orthodontics and Dentofacial Orthopaedics, Yogita Dental College & Hospital, Khed, Ratnagiri, Maharashtra.

\*Correspondence: Dr. Mandar Chandrachood (drmandar5@gmail.com)

ORCID ID: 0000-0001-5111-2983

#### ABSTRACT

**Background:** Evaluation of students' performance forms one of the most important aspects in delivery of curriculum. Formative assessment & summative assessment both are widely practiced all across globe. The current study tries to establish effectiveness of formative assessment to predict outcomes in summative examination.

**Materials and Methods:** This study employs retrospective observational study using the academic records of the first year students in Bachelor of Dental Surgery (BDS) course. The data was subjected to correlation studies applying Pearson's correlation coefficient.

**Results:** There is a strong positive correlation between performance in formative assessment and summative assessment for theory examination, whereas there is a moderate positive correlation between performance in formative assessment and summative assessment for practical examination.

**Conclusions:** The internal examinations are having a moderate to strong positive correlation in predicting results of final examination; but it may not be consistent. The purpose of formative assessment is served in existent academic set-up.

**Keywords:** Continuous Internal Assessment (CIA), Formative Assessment, Health Science Education, Summative Assessment

#### INTRODUCTION

Curriculum is a formal plan of educational experiences and activities offered to a learner by an educational institution, where knowledge, skill and values are to be developed during the course of health science professional education. Every activity of curriculum planning must be simultaneously

associated with a definite evaluation plan.<sup>1</sup> It has been often observed that for most of the learners, assessment is the prime driving force for mastering specific learning objectives underlined in the curriculum to be precise evaluation drives learning.<sup>1,2</sup> A good assessment or evaluation method has often been considered as a continuous process which gives feedback during delivery of curriculum as well as at

completion of curriculum. Thus, two important methodologies of assessment meant for knowing effective delivery of curriculum are often practiced widely. They are namely 'formative' which is conducted during delivery of curriculum also considered as continuous assessment process and 'summative' which is conducted at the end of delivery of curriculum. Popham WJ succinctly and comprehensively defined formative assessment as a planned process in which assessment-elicited evidence of students' status is used by teachers to adjust their ongoing instructional procedures or by students to adjust their current learning tactics.<sup>3</sup> His definition was a modification of Formative Assessment for Students and Teachers - State Collaborative on Assessment and Student Standards (FAST SCASS) definition given in 2006.<sup>3</sup> Maharashtra University of Health Sciences (MUHS) has adopted Continuous Internal Assessment examination (CIA) as the method of formative assessment during delivery of various curricula and has subscribed specific importance to these examinations while scoring the students. However, the degree of significance is assigned to CIA is variable depending on the academic course (i.e. MBBS, BDS, BAMS, BPT, etc.). There is no uniformity in ascribing importance to CIA as well as methods for conducting CIA amongst all the courses offered by MUHS. This current study was conducted using data generated for First Year BDS (Bachelor of Dental Surgery) students. In Dentistry course there is no specific qualifying limit assigned for performance in formative assessment examination to be eligible for summative assessment. This calls for analysis of correlation between the performance in formative assessment and summative assessment.

It is also suggested by few authorities that formative assessment provides guidelines for remedial measures to be executed in the teaching-learning process to improve performance in summative assessment.<sup>4</sup> It is often experienced that not only formative but also the summative assessment has influenced overall behavior of learners as well as educators because they have often been used to measure the performance of not only learners but also educators. This is very much synchronous with a quote that says: "The evaluation has pushed out of

education field the entire purpose of education: enrichment of life by enlarging the horizon of mind".<sup>1</sup>

To avoid this effect it is essential to maintain a very high standard of assessments for academic courses. To maintenance of high-standards of formative assessment examination which can be a good predictor of outcome in summative assessment is largely a burden on human resources, logistic arrangement as well as academic calendar. Taking into consideration recent trends about completion of admission process, late reporting of students to first year of professional health science education leads to late commencement of academic activities. The effects of these delays are most pronounced in the courses which have only 1 year duration for completing First Professional Year of health science education. This might cause quantitative as well as qualitative truncation of whole teaching-learning exercise and experience for students as well as for teachers. Thus there is a dire necessity of evaluating effectiveness of existent methods of formative assessment to predict the students' performance in summative assessment. The current study is undertaken to understand correlation between performance of students in formative and summative assessment examination for first year of BDS in General Physiology and Biochemistry.

## MATERIALS & METHODS

The present study is retrospective observational study. The academic records of the first year students in BDS course, saved in the Department of General Physiology and Biochemistry were used. The academic records of 88 students who admitted for the academic year 2016-17 were included in the study. The results of internal assessment examinations expressed in percentage scores namely first internal assessment examination, second internal assessment examination, preliminary examination (formative) and final university examination (summative) were considered for data collection. The aggregate percentage scores of all three internal assessment examination as well percentage scores of preliminary examination alone were considered for finding association with summative assessment. The correlation between performance in both theory as well as practical examinations held was considered

for establishing association between formative and summative assessment examinations. It was based on rationale that preliminary examination is conducted after completion of delivery of curriculum exactly as per final university examination pattern and thus may serve as perfect simulation of summative assessment; whereas aggregate score of all internal assessment examination gives fair idea about overall performance of the student throughout the year. Complete anonymity of the students was ensured during the study as well as while analyzing the results. The data generated was interpreted using computer based software EpiInfo™ 7.2 (CDC, USA).

## RESULTS

Preliminary theory examination mean was 49.90% (SD=11.84), Preliminary practical Examination mean was 72.58% (SD=6.02). Aggregate Internal examination mean was 52.63% (SD=11.23), Aggregate Practical examination mean was 76.77% (SD=5.40), Final Theory examination mean was 59.86% (SD=9.18), Final Practical examination mean was 73.16% (SD=8.99). (Table 1)

Pearson correlation coefficient (r) test was applied to find correlation between performance in final

examination versus performance in preliminary examination as well as versus aggregate performance in all internal examinations in both heads viz. theory and practical.

For theory examination, it shows that there is a strong positive correlation of performance in preliminary examination and aggregate performance in all internal examinations with the performance of students in final examination. The aggregate internal scores ( $r=0.684$ ) showing marginally better association with scores in final university examination as compared to scores in preliminary examination alone (0.679); whereas for practical examination, there is a moderate positive correlation between performance in preliminary examination and aggregate performance in all internal examination with performance in final university practical examination. Here also, the trend is similar i.e. the aggregate internal scores ( $r=0.485$ ) showing marginally better association, if any with scores in final university examination as compared to scores in preliminary examination alone (0.431). (Table 2) (Figure 1-4)

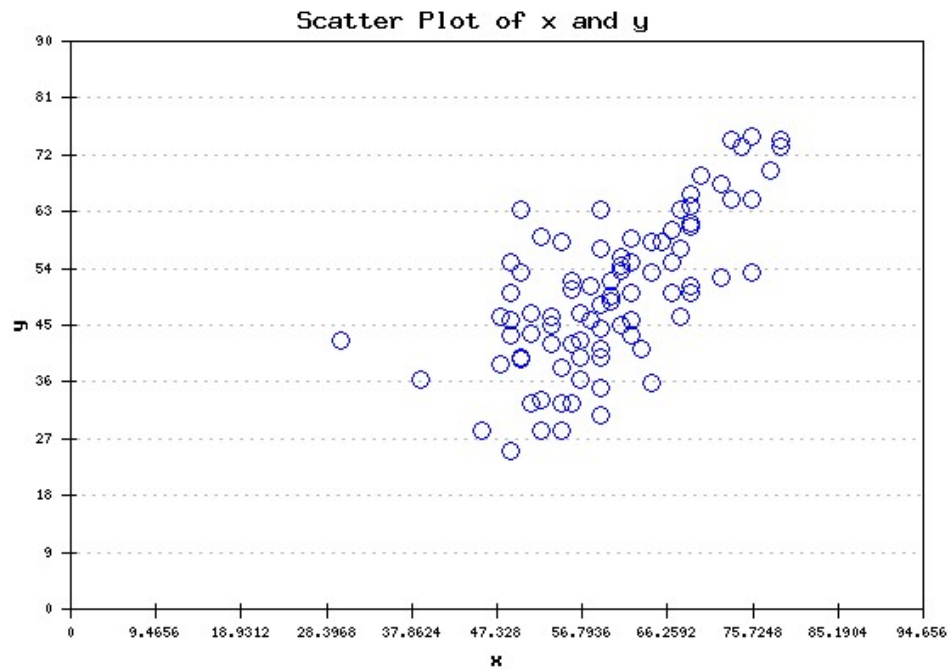
**Table 1: Performance of students in various assessments**

	<b>Prelim Theory</b>	<b>Internal Theory</b>	<b>Final Theory</b>	<b>Prelim Practical</b>	<b>Internal Practical</b>	<b>Final Practical</b>
<b>Mean</b>	<b>49.90</b>	<b>52.63</b>	<b>59.86</b>	<b>72.58</b>	<b>76.77</b>	<b>73.16</b>
<b>SD</b>	<b>11.84</b>	<b>11.23</b>	<b>9.18</b>	<b>6.02</b>	<b>5.40</b>	<b>8.99</b>

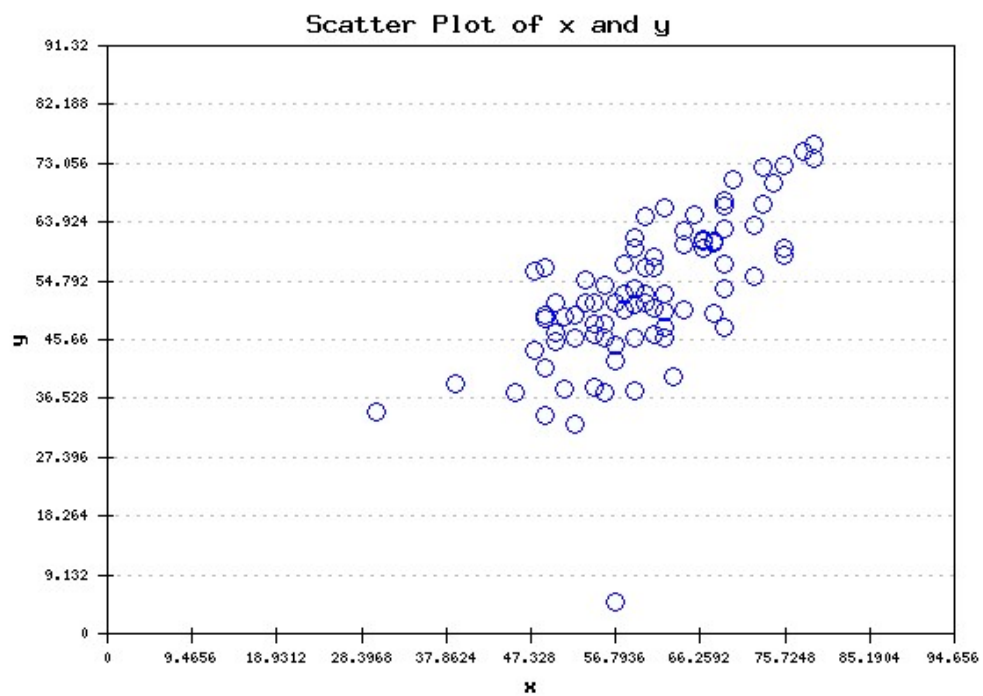
**Table 2: Correlation of performance of students in preliminary and final examination**

<b>Examinations compared</b>	<b>Theory (r)</b>	<b>Practical (r)</b>
Preliminary Vs. Final University	<b>0.679</b>	<b>0.431</b>
Aggregate Internal Vs. Final University	<b>0.684</b>	<b>0.485</b>

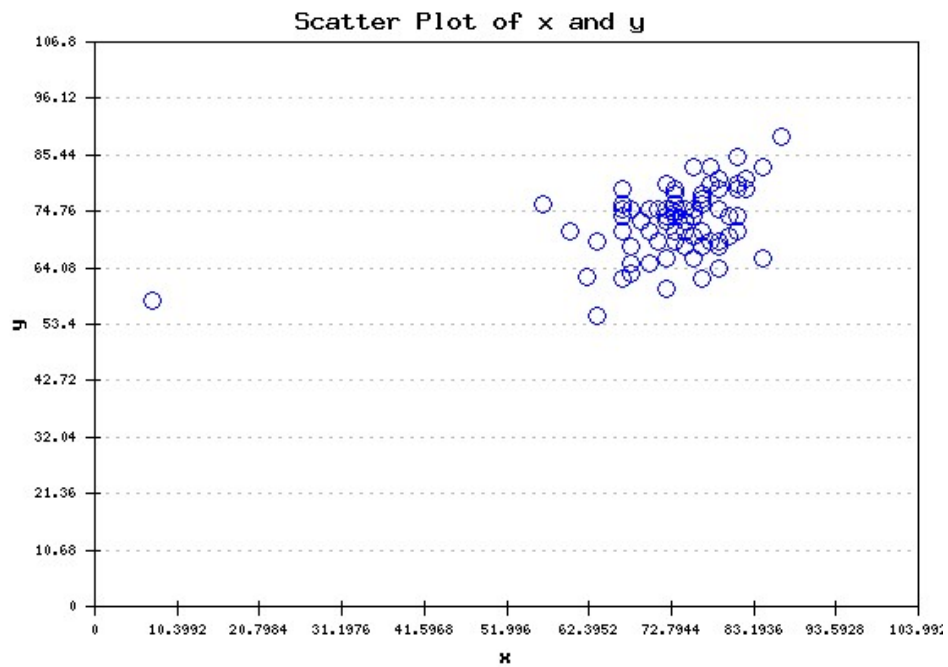
**Figure 1: Preliminary Theory (x) Vs University Theory (y) Examination ( $r = 0.679$ )**



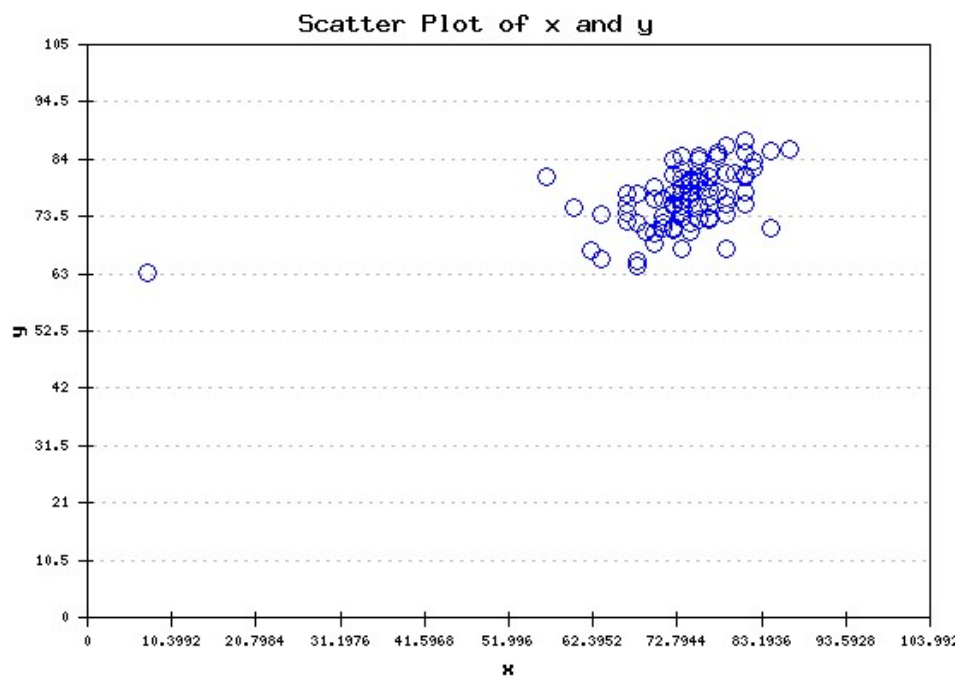
**Figure 2: Aggregate Internal Theory (x) Vs University Theory (y) Examination ( $r = 0.684$ )**



**Figure 3: Preliminary Practical (x) Vs University Practical (y) Examination ( $r = 0.431$ )**



**Figure 4: Aggregate Internal Practical (x) Vs. University Practical (y) Examination ( $r = 0.485$ )**



## DISCUSSION

The results of our study suggest that, there is a moderate to strong positive correlation between performance in internal assessment examination and final university examination. Thus, internal examinations are having considerable degree of association in predicting results in final examination; but it may not be consistent and reliable. Similar to our findings, most of the studies conducted across the world show a very promising positive association between the performance in formative assessment and summative assessment.<sup>5, 6, 7, 8</sup>

There are very few studies conducted in India which have tried to study the effectiveness of formative assessment to deduce a positive result in summative assessment. One of them conducted by Santra R et al also shows similar positive association between formative assessment and summative assessment.<sup>9</sup> But the actual scenario may not truly be following same trend as explained by many health educators' experiences. We observed that one of the internal examinations, preliminary examination is usually conducted exactly as per pattern of final university examination. Thus, ideally it works as a simulation of summative assessment students. However, it does not have a strong positive association with the results of summative assessment carried out by independent external assessors. This can be because of:

1. Time duration attributed to delivery of curriculum – academic courses starting late due to prolonged admission process and reshuffling of students are peculiar contributor for all first professional year. Both leading to lesser time for complete delivery of curriculum in stipulated time.
2. Disparity between the standards of conduct as well as assessment of internal examination and final university examination.
3. Student factor of assigning lesser importance to formative assessment as it is not a certifying examination (for BDS Course). Thus there can be difference in level of preparation and motivation during formative assessment and summative assessment.

4. The time span between last formative examination and summative examination is also a determinant. An optimum span (preparatory leave) is often recommended for implementing remedial measures. For some cases mentioned in cause 1, in case of incomplete delivery of curriculum in stipulated time; the preparatory leave may be compromised for complete delivery of curriculum. Thus it can cause less time allowance for self-study and self-directed learning of the students. Too much span between conduct of theory and practical examinations during summative assessment has been often a period of wash-out for students' attention towards academics.

These are definitely not the only causes but are the most glaring causes for lesser predictability of formative assessment. These conclusions drawn definitely call for implementation of better formative assessment practices to match up to the summative assessment in delivery of variety of health science education of curricula offered.

Many universities and institutions employ CIA for formative assessment but summative examination remains the ultimate and the most important examination for certification or graduation to next academic level. It has been observed that although formative assessment (CIA) allows greater degree of opportunity for learning and provides insights to learner as well as educators to rectify or to modify teaching-learning methods employed during delivery of curriculum, but the summative assessment still remains the strongest driver influencing students' learning behaviour.<sup>2,10</sup> Thus, it has been hypothesized that most of the students tend to underperform in formative assessment as compared to summative assessment. So the predictive, diagnostic and analytical role of formative assessment has been less effective as compared to certifying, ranking, selective role of summative examination.<sup>1,2</sup>

Our study suggests that the purpose of continuous internal assessment examination or formative assessment is served. But, it also must be realised that maintenance of high-standard of formative assessment demands a great amount of investment of human hours, stationery, chemicals and other logistic

provision. If we consider the number of institutions involved in the process of health science education, the quantum of investment in the above mentioned parameters is humongous. Besides a burden on teaching, non-teaching and administrative staff members; these examinations also serve as a potential stressor for all the students and can be one of the predisposing factor for physical, mental ill-health of the students.

Implementation of more objective methods of practical or skill assessment via Objective Structured Practical Examination (OSPE) or Objective Structured Clinical Examination (OSCE) requires extensive training of observers thus calls for plenty of investment in time, space, material as well human resources. Even if we decide to conduct all the examinations in computer based fashion or online fashion, it still requires robust technical support, technological sophistication, customization as per needs of the curriculum, digital data storage facilities, digital security and staff-student training. Thus, these modalities too are not devoid of psychological stressors on examiner and examinee.<sup>11</sup> Previous research in India on medical subjects has established a strong link between attendance and student performance, with positive correlations found between the two. However, this study did not investigate the impact of attendance.<sup>12,13,14</sup>

### Limitations of the study

This study has been conducted on a small representative population of 88 students. A larger scale study with multiple subjects and all the years of health science courses may give a more precise result with greater reliability and more insight about trends of the association between formative and summative examination.

### CONCLUSIONS

There is a moderate to strong positive correlation between performance in internal assessments and final university examination. Thus, internal examinations are having considerable degree of association in predicting results in final examination; but it may not be consistent. The purpose of continuous internal assessment examination or formative assessment is served in existent academic

set-up. The rigorous interventions must be initiated to make every formative assessment more valid and reliable to be a better predictor of outcome of summative assessment.

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