

**CORRELATION OF STUDENT PERFORMANCES IN PHARMACOLOGY  
FORMATIVE AND SUMMATIVE EXAMINATIONS**

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### Summary

Formative assessment facilitates improvement in instructional practices, identifies “gaps” in the curriculum, and contributes to increased student performance. Literature review revealed that limited evidence investigates the group that may benefit the most from formative evaluation, the low performing students.

The primary objective of this study is to assess and correlate the performance of students in pharmacology formative examinations who have averaged 60% and above (high performers) and who have averaged less than 60% (low performers) in the summative examinations.

Student performance data (i.e. percentage marks) for each of three consecutive formative examinations and the summative examinations of batches, 2006-07 & 2007-08 were acquired from central student records and analyzed. Statistical analysis was done using McNemar, and Pearson’s co-efficient of correlation.  $P < 0.05$  was considered significant.

The present study revealed that out of the 502 students who appeared for both formative and summative examinations, 318 have scored greater than 60% in summative examinations. Out of these 318 students, 235 (73.9%) students have scored greater than 60% in formative examinations ( $P < 0.001$ ). Out of the 184 students who have scored less than 60% in summative examinations, 44 have scored less than 60% in formative examinations ( $P < 0.001$ ). Formative examinations correlate more positively with summative examination performance in high performers ( $r=0.697$ ) when compared to low performers ( $r=0.29$ ).

The present study concludes that formative examinations are better predictors in high performers compared to the low performers; hence we cannot rely solely on formative assessments to improve performance in the latter group.

**Key words:** pharmacology assessment, formative examinations, summative examinations

### Introduction

Learning is a continuous process which modifies the thought, emotions and actions of the learner. Assessment has sufficiently powerful effects on learning to be the *de facto* curriculum (1). This includes not only what is learnt, but also students' approaches to learning (2,3,4). The marks secured in the certifying (summative/final) examination may not reflect on the regularity of the student. It can only be judged by the continual assessment of the student throughout the year.

Formative assessment occurs when educators feed information back to the students which enable them to learn better and engage in a self-reflective process regarding the feedback (5, 6,7). Its purpose is to provide both feedback on performance and suggestions for improvement (8, 9). Formative assessments that provide timely, relevant and supportive feedback (not just grades) can contribute to improved learning outcomes (10).

In contrast, summative assessments evaluate the students at a given point in time and therefore predominantly utilized for grading and certification at the end of a period of study (11, 12).

Summative assessment requires making a judgment about the learning that has occurred and is not designed to provide the immediate feedback useful for helping students during the actual learning process. Indeed, one of the major weaknesses of most modern higher education programs, as evidenced by course evaluation surveys, is failure to provide adequate feedback to students on their learning (13). It should be noted that the provision of diagnostic and remedial feedback has been found to be one of the most potent influences on student achievement (14). If the purpose of assessment is to foster better learning outcomes, it could be argued that formative assessment is the most important assessment practice (15).

Formative assessment over the course of a few years have evolved to be a common method advocated, both to improve the pedagogical practices of teachers and to provide specific instructional support for lower performing students. Research has conclusively demonstrated that the use of formative assessment facilitates improvement in instructional practices, identifies “gaps” in the curriculum, and contributes to increased student performance (16). However, literature review revealed that limited evidence investigates the group that may benefit the most from formative evaluation, the low performing students.

In the present study we aimed to assess and correlate the performance of students in the pharmacology formative examinations who have averaged less than 60% (low performers) in the summative examinations. Likewise the performances of students scoring greater than 60% (high performers) were also analyzed.

It is hoped that the current study would contribute towards appraisal of the efficiency of formative examinations to predict the performances of students in summative examinations with the view to introducing possible adaptation as appropriate taking into cognizance the dynamism of the evolving educational technology. It is also expected to shed greater light on the relevance and value of formative examinations in low performing students.

### **Methods**

#### **Course logistics:**

The Pharmacology course in Kasturba Medical College, Mangalore, Manipal University is offered during the second year of the students' MBBS curriculum. The class usually consists of about 200-250 students depending on the set admitted and their year of admission. The duration of the course span for a total of 18 months period is divided into three semesters. The students normally receive lectures as a group (three hours per week) and one practical session per week (two hours per week); each semester extending for a period of 24 weeks.

#### **Professional examinations protocol:**

Student evaluation consists of formative examinations at the end of each semester and a summative university examination which are conducted for both theory (written & viva voce) and practicals. The written theory paper consists of two parts namely: part-1: multiple choice questions (MCQ), where four options are given for a question and the right answer should be picked and part-2: short essay questions (SEQ) (theory paper) covering the various aspects and units of the course.

**Scoring pattern:**

The theory paper is for 60 marks which include questions for 2, 3, 5 and 9 marks. The MCQ paper consists of 40 questions for 20 marks. 0.5 marks is awarded for the correct answer and 0.166 marks is deducted for a wrong answer. The theory paper is evaluated by the teaching faculty and the MCQ answer sheet which is an OMR sheet is evaluated by an optical scanner.

**Study design:**

Student performance data (i.e. percentage marks) for each of three consecutive formative examinations and the summative examinations of batches, 2006-07 & 2007-08 were acquired from central student records and analyzed. The performances of students scoring 60% and above and students scoring less than 60% in the summative exams were correlated with their performances in the formative exams. To avoid bias, only the theory marks comprising of multiple choice questions and short essay questions and the marks scored in Viva Voce were taken into consideration because in the practical examination, the exercises will not be the same for all the students.

**Data analysis and statistical methods:**

All the scores were analyzed using Mc Nemar test. Co-relation coefficient between formative and summative examination components were estimated using Pearson's product moment method. In all analyses, a P-value of less than 0.05 was considered as statistically significant. Statistical package SPSS (version 11.5) was used for the analysis.

The University's principles and procedures on research ethics were adhered to throughout the study. In particular, data on student performances were presented such that identification of individual student performance is impossible, thereby complying with the requirements of Data protection Act.

**Results**

The present study revealed that out of the 502 students who appeared for both formative and summative examinations, 318 have scored greater than 60% in summative examinations. Out of these 318 students, 235 (73.9%) students have scored greater than 60% in formative examinations ( $P < 0.001$ ). Out of the 184 students who have scored less than 60% in summative examinations, 44 have scored less than 60% in formative examinations. ( $P < 0.001$ ) Formative examinations co-relate more positively with summative examination performance in high performers ( $r=0.697$ ) when compared to low performers ( $r=0.29$ ).

**Discussion**

Assessment is critically important to education both for accreditation and to support learning (17). Formative examinations offer great promise for shifting classroom practices toward a culture of learning (18, 19). The landmark review by Black and Wiliam (1998) is the most widely cited reference on formative assessment and stands behind the common knowledge that "Everyone knows that formative assessment improves learning." Black and Wiliam examined 250 studies from research literatures addressing current classroom practices; student motivation and student participation in assessment practices; learning theory; specific classroom strategies such as discourse and questioning; and the properties of effective feedback.

They concluded that formative assessment has a more profound effect on learning than do other typical educational interventions (15). It has been claimed that formative assessment practices tend to help low achieving students more than they help high-achieving students explained by the fact that formative assessment helps to develop metacognitive skills and enhance motivation differentially for low-achieving students because high-achieving students already have these resources intuitively or through other supports (20). This observation is in contrast to the results of this study which shows that the performances of low scorers in formative examinations correlated lesser with summative performances when compared to the high scoring students.

Sly (1999) investigated the influence of practice tests as formative assessment to improve student performance on computer-managed learning assessments. The students who selected to take practice tests did significantly outperform those who did not take practice tests on both unit exams one and two. While Sly's (1999) results provide support for the impact formative assessment may have on achievement, this study also suffered from methodological issues. The primary issue with this study is the self-selection of participants to treatment or control groups. This is a problem because students who self-selected to take practice tests may be systematically different from those students who do not select to take practice tests (21).

In another Web-based study, Henley (2003) studied the impact of Web-based formative assessment on student learning in a learning unit about metabolism and nutrition. She found that overall students in the top ten percent of the class accessed formative assessment twice as often as students in the bottom ten percent of the class (22). While this does reflect a significant difference in usage of formative assessments, it suffers from the same self-selection issue as Sly's (1999) study. The group that used formative assessment twice as often and ranked in the top ten percent of their class was a systematically different group from the bottom ten percent of the class who rarely accessed the formative assessment. Further, in most school systems the current trend is to use formative assessments for the lowest performing students. The Sly (1999) and Henly (2003) studies have based their conclusion of the impact of formative assessments on the higher performing students, with limited evidence of their utility for these lower performing students.

It has been shown that students choosing to use formative exam questions as a learning tool had higher scores on their summative exams. However, it has been argued that it was primarily the 'better students' who availed themselves of the educational opportunity to take formative examinations and this is why the formative exam-takers performed better in the subsequent summative exams (23). The results of our study also proves this observation in that formative examinations were better predictors of summative performances only in higher performing (>60%) students as compared to the lower performers.

### **Conclusion**

The present study concludes that students scoring better in Pharmacology formative examinations invariably scored better in the summative examinations. However, formative examinations are better predictors in high performers compared to the low performers. Formative tests are essential to provide both low performers & high performer students to plan out their learning process and perform better in summative examination. Feedback is an essential concept of formative assessment. As such, we as teachers need to demonstrate to our students how to use our resources to their advantage. Perhaps to do this we may need to review our feedback and ask ourselves is it good enough?

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