

# Significance of Skill Reinforcement in Undergraduate Teaching: A Medical College Experience

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## Abstract

**Background:** In pathology, peripheral blood smear (PBS) interpretation is one of the essential hematological investigations and so is the skill of smear preparation. Among students, this skill seemed to decline with time. Although as syllabus mandatory they had learned to do smear preparation in first year Bachelor of Medicine and Bachelor of Surgery (MBBS), in second year pathology practical assessments their performance for the same was found ineffective. Therefore, the study was taken up to know if there would be skill improvement of their previously acquired ability when reinforced.

**Aim:** The study was taken up to assess if there was skill improvement after a lecture-demonstration sessions using objective structured practical examination (OSPE) as an assessment tool.

**Materials and Methods:** A total of 36 randomly selected second year MBBS students from the Department of Pathology, Mandya Institute of Medical Sciences consented to be study participants. A pre-study assessment followed by post-lecture and post-demonstration sessions in gaps of each week was conducted and assessed, respectively. OSPE was the assessment method for a total score of 10 at each time. Statistical analysis for mean, standard deviation, and inferential statistics *t*-test was performed using EpiData software. Feedback from the students and faculty was taken.

**Results:** A considerable improvement between pre-study with postlecture and pre-study with postdemonstration was noted with  $P = 0.001$ . Furthermore, postlecture with post-demonstration analysis showed improvement with  $P = 0.002$ .

**Conclusion:** Lecture-demonstration of PBS preparation reinforced previously acquired knowledge of this essential skill required for a competent undergraduate student.

**Key words:** Objective structured practical examination, Peripheral blood smear, Practical demonstration, Reinforcement, Undergraduate student

## INTRODUCTION

Pathology bridges the gap between basic sciences and clinical medicine. Peripheral blood smear (PBS) interpretation is one of the basic investigations in laboratory practice.<sup>1</sup> It is a mirror of ill health ranging

from infections to malignancy. Thereby assists clinicians in patient screening, diagnosis, monitoring disease progression, and therapeutic response in the evaluation of hematologic disease.<sup>1</sup> Although automation and molecular techniques in hematology are in use, still for many diseases the data from these analyzers would show a normal blood count but may miss on abnormal cellular morphology.<sup>2</sup> The automated techniques developed for smear preparation are reported to be inferior to the ones prepared by an experienced professional.<sup>2</sup> Hence, the diagnostic relevance of manual PBS reporting is still a worth. Therefore, it becomes important to have a well-prepared blood smear. This warrants careful attention toward the technique of good quality smear preparation.<sup>2</sup>

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In pathology practicals, we observed during the formative and summative assessments that students' performance on smear preparation was inefficient. As per university syllabus, the students in first-year Bachelor of Medicine and Bachelor of Surgery (MBBS) course mandatorily learn the skill of smear preparation. However, this skill seemed to decline with time. Therefore, the study was taken up to reinforce this essential skill.

Objective structured practical examination (OSPE) is a structured practical assessment system designed for pre- and para-clinical subjects.<sup>3</sup> Here, the students' competency for various skilled tasks is tested at series of set stations. Assessment is done as per the predetermined checklist in each station by an individual examiner. Studies on OSPE have reported it to be objective, valid, and reliable with wide discrimination index compared to the conventional practical method.<sup>4</sup> The examiner bias is eliminated. OSPE tests different desired components of competence better. It helps assess the domains of education involved in integrating knowledge and practical skills required for competent learning. This would influence student learning and provide an opportunity for improving the teaching and learning process through feedback.<sup>3</sup>

### Aim

The study was taken up to assess if there was an improvement in PBS preparation skill after a lecture-demonstration sessions using OSPE as an assessment tool.

## MATERIALS AND METHODS

We conducted a before and after quantitative study in the Department of Pathology, Mandya Institute of Medical Sciences, Mandya, in the months of January and February 2016. The study was started after obtaining clearance by the Institutional Ethical Committee. The study subjects included 36 randomly selected second year MBBS pathology students. OSPE was set up with five stations. These included two procedural stations, a questionnaire, an interpretative, and a rest station. Complete procedure time was kept at 25 min. The assessment was done for total of 10 marks using standard checklist. A pre-study OSPE was done to assess the already acquired skill ability of smear preparation. In the next week, didactic lecture was taken and with gap of a week post-lecture OSPE was conducted. In the consecutive week, 36 students were divided into small batches of six each. The assigned faculty for each batch did practical demonstration of the skill. Then, each student was allowed to practice under supervision. After a gap of 2 weeks, the post-demonstration (postdemo)

assessment was performed. The scores of three OSPEs were statistically analyzed. Feedback from the students and faculty was taken.

### Plan of Statistical Analysis

Mean, standard deviation (SD) and inferential statistics *t*-test using EpiData software was done.  $P < 0.05$  was considered as statistical improvement.

## RESULTS

The study highlighted the need to reinforce the skill of PBS preparation in the second year during pathology practical. On evaluation of the OSPEs at three different points of time in the study, a remarkable improvement in the mean score and SD of the students was noted. The mean  $\pm$  SD score was analyzed among the 36 students. In the prestudy, it was found to be  $2.25 \pm 1.402$ , postlecture  $6.28 \pm 1.684$ , and after postdemonstration  $7.19 \pm 1.849$ . The comparison of total scores obtained in prestudy, postlecture, and postdemo displayed a statistical considerable improvement in the student learning ( $P = 0.001$ ). A considerable difference between pre-study and post-lecture scores was observed and it was statistically measurable ( $P = 0.001$ ). Similarly, pre-study and post-demo ( $P = 0.001$ ) and post-lecture and post-demo scores showed improvement ( $P = 0.002$ ) (Tables 1 and 2, Graph 1).

## DISCUSSION

Practical skills play a central role toward delivering successful patient health care. The success of the performance is dependent on the competency of the performer.<sup>5</sup> Reinforcement skill is meant for increasing the

**Table 1: Mean and SD in the study subjects related scores**

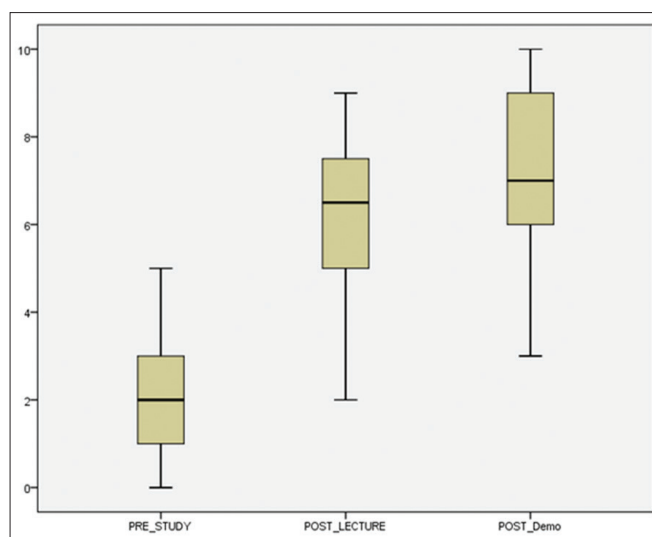
	Number of subjects	Mean $\pm$ SD	Range
Prestudy	36	2.25 $\pm$ 1.402	0-5
Postlecture	36	6.28 $\pm$ 1.684	2-9
Poststudy	36	7.19 $\pm$ 1.849	3-10

SD: Standard deviation

**Table 2: Paired *t*-test was used to know a significance difference before and after intervention**

	Mean $\pm$ SD	<i>t</i> -test	<i>P</i>
Prestudy and postlecture	4.028 $\pm$ 2.490	9.706	0.001
Prestudy and postdemo	4.944 $\pm$ 2.460	12.057	0.001
Postlecture and postdemo	0.917 $\pm$ 1.645	3.345	0.002

SD: Standard deviation



**Graph 1: Boxplots show the median, interquartile range, outliers, and extreme cases of individual variables according to scores**

participation of learners in the development of teaching process. The use of positive verbal and non-verbal cues would be the key component for this skill.<sup>6</sup>

This study highlighted that demonstration and practice under supervision improved PBS preparation skill considerably. In a cross-sectional descriptive study analysis by N. Upadhyay *et al.*, of 63 MBBS students and 24 basic medical sciences teachers, it was observed and also suggested that for the effective skill development practical demonstrations was very helpful. The authors also stressed that students should practice under supervision so that should any doubts arise during learning, the teachers could solve them at that moment.<sup>7</sup>

The observational analysis in this study showed good impact on students' learning behavior by forming small groups and practice under our supervision. Wader *et al.* in their study on new practical teaching methodology - "active learning" with emphasis on clinicopathological correlation for the second year MBBS 120 students, and 8 pathology postgraduate residents has also opined that in any study forming smaller student groups and making them practice under supervision is to be appreciated for easy, interactive, and clinically relevant learning.<sup>8</sup>

We had observed that although students learned this skill in the first year as a mandatory in the syllabus, but their performance in second year pathology assessments was found to be unsatisfactory. Hence, an attempt was performed toward reinforcement of the same. Reinforcement-learning mechanism model for skill learning recommended by Fu and Anderson was used in this study. The author's impression was that this learning

model for recurrent choices could be accounted for skill learning. The student tasks performance is dependent on learning which element to select in the presence of each object. Hence, the main component of this skill learning style is to know when to apply the right action given particular cues in the environment. Thereby in skill acquisition, this action may be considered as one of the core learning component.<sup>9</sup>

Another comparable study was done by the author Codagen using George and Doto's five-stage approach abbreviated as "SETT UP." Its expansion meant setting the scene to establish prior experience, to talk through the procedure, tips and tricks (provided by the instructor), undertake procedure (with direct supervision) and post-procedure feedback. This learning approach would lead to immediate correction of errors. A positive reinforcement hopefully would help the learner to develop skill mastery.<sup>10</sup> Our study set up coincides with this approach.

In this study, OSPE scores statistically showed improvement in students' performance (Tables 1 and 2, Graph 1). The method tested both domains of knowledge and practical skill. Comparison of the pre-test, post-lecture, and post-demo scores showed statistical considerable improvement in the skill acquisition. Studies using OSPE as assessment have reported the methodology to be an effective method of evaluation with reliability and validity. Authors M Feroze and Jacob conducted pathology practical assessment for a batch of 64 students who were divided equally into two groups. One group took OSPE and the other conventional system of assessment. OSPE had six stations and included three categories of clinical pathology, spotters, and interpretative exercises. In the clinical pathology, one of the exercise kept for assessment, was on peripheral smear staining. The authors noted that OSPE measured practical skills better, as it was an objective, valid and reliable method without examiner bias. Interpretative exercises were the most relevant part and deserved the lion's share of total marks.<sup>4</sup>

In the study by Patil and Saini, OSPE was conducted in the formative assessment for 25 second-year MBBS students in pathology. Total of 20 marks were allotted for 10 stations. The authors concluded that assessment by OSPE could be considered as an effective tool for students' deep learning which would involve understanding and interpretation. Suggested that it could be used for formative and as a part of summative assessments. It would also definitely meet the specific criteria for judging and grading successful performance. Among students, the assessment system was opined to be fair, uniform with no bias. The authors also observed that OSPE created a comfortable, nonthreatening atmosphere. Accordingly, this assessment

method was found to have objectivity, reliability, validity, and was feasible.<sup>11</sup>

Munjal *et al.* in their study used OSPE during the second pathology internal assessment examination for a total of 24 students. They were divided into batches and groups. OSPE had six stations for 10 min each. The six stations were divided into three categories. Peripheral smear staining was one of the exercise included in the clinical pathology category. Spotters and interpretative exercises formed the other two categories. The students feedback revealed that more than 90% of them agreed that OSPE was less stressful to perform and more comfortable. The authors concluded that OSPE tested different desired components (practical and correlative skills) of competence better.<sup>12</sup>

In one more study by Jaswal *et al.*, OSPE as a tool was introduced at the stage of formative assessment for biochemistry practical skills. The study group was 94 first-year MBBS students. The student feedback reflected that OSPE improved their practical skills. They expressed satisfaction with the method of assessment and were confident in performing the skills. Faculty felt that OSPE provided satisfaction and motivation to adopt it as an assessment tool.<sup>3</sup>

From our students' feedback, we noted that skill learning of PBS preparation by reinforcement was well accepted and appreciated by them. Faculty also opined that reinforcement satisfactorily improved the student's skill performance and OSPE assessment was uniform. Similar observations have been made in other studies. The authors have suggested that feedback should become the central component of the effective assessment.<sup>3,7,11,12</sup> This would help pull through drawbacks in the conventional teaching-learning method and provide further improvement and standardization.<sup>7</sup>

## CONCLUSION

In pathology ideal, PBS is a prerequisite for its proper interpretation. In this study, lecture-demonstration of PBS preparation reinforced previously acquired knowledge of this essential skill among the students. Skill reinforcement for undergraduates would become essential in moving toward the vision of competency-based medical education. Need for undergraduate curriculum to stress for reinforcement of teaching-learning aimed at skill competency across all medical colleges.

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