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Research Article

Effectiveness of the Modified Peyton's Method inTeaching Acid-Fast Staining for Phase II Indian Medical Graduates

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I N F O

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A B S T R A C T

Introduction: Indian medical graduates are given hands-on training in fundament microbiology techniques, including Gram'sstaining, Ziehl–Neelsen staining, Albert's staining, and Stool examination. Most of the colleges follow the traditional 'see one-do one' method. An interesting method of teaching which is gaining importance in recent years is Peyton's method which is designed for a 1:1 student-teacher ratio. This study seeks to assess the effectiveness of the modified Peyton's method compared to the 'see one, do one' approach.

Material and Methods: A study will be conducted with 36 students in the experimental group being taught using a modified Peyton's method, while a control group of 35 students will be taught using the "see one, do one" method. The faculty will objectively assess the students' performance as part of the study.

Results: The study group significantly outperformed the control group in acid-fast staining.

Conclusions: This study demonstrates that the modified Peyton's method is more effective in teaching practical skills to students compared to the traditional "see one, do one" method. The outcome of this method is beneficial to both students and teachers, as per feedback provided by the students and tutors.

Keywords: Modified Peytons Method, Acid Fast Staining, See One-Do One Method, Medical Education, Microbiology

Introduction

Learning processes is a crucial component of health professional education. In the past, the research of procedural skill development was mostly focused in the field of medical education. Evaluation and teaching methods for these abilities have also been created in other health professions like nursing and physiotherapy education[1]. Making Indian medical graduates (IMGs) clinically competent

and globally relevant is the goal of the new competency-based medical education (CBME)[2]. In microbiology, the CBME curriculum emphasises the acquisition of core competencies, which includes, basic microbiological investigations and the diagnosis of infectious diseases. It is necessary to provide students with adequate skill training and evaluation for the future medical world. However, it is known that different Indian medical colleges offer different microbiological skill training. Staining techniques, such as Gram's staining and acid-fast staining, are skill-based procedures[3]. An old-fashioned method of teaching procedural skill is the "see one, do one" method. This implies that a teacher explains and performs a method before asking the pupils to practise it. This is known as the Halsted teaching methodology, named after the physician Halsted (1904)[4]. The "see one, do one" method is frequently employed in the training of healthcare workers; however, it has drawn criticism[5]. Walker & Peyton provided a more contemporary instructional strategy for the learning of procedural skills. The stepwise teaching method used by Peyton consists of the following four steps: Step 1 refers to the instructor doing the entire method in real time ("demonstration"); Step 2 refers to the teacher performing the procedure with explanation ("deconstruction"). In step 3 the teacher performs the procedure based on one student's instruction and others watch the technique ("comprehension"), and in step 4 the pupils complete the procedure independently ("performance")[6]. Peyton's technique was initially intended for a 1:1 teacher-to-student ratio. In 2014, this approach was updated for small group instruction and referred to as the modified Peyton technique. Five to eight students, or perhaps more, are often being trained in a skills lab in the medical area. As a result, Peyton's four-step methodology was adjusted to include all pupils while maintaining Step 3, which is essential for the didactic style of learning. Each learner is given the opportunity to practise their specific talent at least once under this model. This strategy works well for small-group instruction and is also doable, simple for instructors to understand, and highlyliked by students[7]. Hence, we intend to compare the modified Peyton's method with the traditional see- one-do-one method in teaching acid fast staining for Phase II Indian medical graduates.

Materials and Methods

- **Study design:** Observational study conducted in the department of Microbiology at Shri Sathya Sai Medical College and Research Institute, Chennai.
- **Sample Size:** A total of 71 students who consented to take part were included in the study. A

The class of 71 students was divided into a study group (36 students) and a control group (35 students). The class was briefed about the study, and consent to participate in the study was obtained. The students were assured of anonymity. The study was conducted after obtaining clearance from the institutional ethical committee. The study was conducted in the month of May 2023.

Methodology

The students were divided into two groups (study and control). A pre-test was conducted for both groups with peer-reviewed question (multiple-option type) on the topic of Acid-fast staining. In the demo class, students were initially instructed on the key theoretical and practical aspects of acid-fast staining. After this, they were divided into groups of six per demonstrator. The control group followed the "see one, do one" method, while the study group used the modified Peyton's method.

'See one, do one'' method

The demonstrator will teach the procedure and principles of the acid-fast stain, after which the students will individually perform the task. Throughout this process, the demonstrator will evaluate the students' practical skills through direct observation and assess their comprehension of the concepts via oral assessment. Subsequently, a post-test will be administered with the same set of questions. Finally, the students will provide feedback through a structured questionnaire, expressing their perceptions and satisfaction regarding the teaching and assessment methods.

Modified Peyton's method

For the study group, the modified Peyton's teaching method was implemented. This five-step modification for small group teaching was developed by an expert group with extensive experience in the subject and medical education.

The modified Peyton's approach consists of the following parts, detailed below for each group:

- **Step 1:** Demonstration- The teacher demonstrates the procedure of acid fast stain without explaining it.
- **Step 2:** Deconstruction: The Teacher demonstrate the procedure of acid-fast staining with explanation.
- **Step 3:** Comprehension: The teacher performs Step 1 following the instructions of one student while all other students are observing.
- **Step 4:** One to One: One students will perform step 2, while the other student will assess and give feedback, and vice-versa.
- **Step 5:** Execution: All students will perform step 2; the teacher will assess and give feedback.

Students are evaluated by the teacher by assessing the practical skills through the direct observation method and their ability to understand the concepts through an oral assessment method. The described model allows each student to perform the respective skill three times.

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Attentive peer observation followed by peer feedback is implemented to maintain the attention of all participating students and to benefit from the active performances of their peers. The post-test was conducted, and feedback was received from the students. The feedback collected was reviewed, and corrections and improvements were communicated to the students in a positive manner. Students were then asked to perform the procedure again, with direct observation, oral assessment and a structured questionnaire utilised for both formative and summative assessment. For checklist refer Table 1 and Table 2. Data analysis and interpretation were conducted using IBM SPSS 23.0 statistical analysis software.

Data Analysis

Data will be entered in MS Excel and statistical analysis will be done by SPSS 16 software using descriptive statistics for mean and standard deviation, using a paired t-test for the pre & post-test of the study and control group and an unpaired t-test for the comparison of the mean in the study and control group of the oral assessment with a 5% level of significance and a 95% confidence interval.

Results

A total of 71 undergraduate medical students participated in the study. All of the participants in the research had never been exposed to the acid-fast staining. By comparing the results of both groups by formative and practical assessment, the learning process was assessed. Each procedure's performance was assessed, as indicated in Tables 3-5.

On assessing the theoretical part of acid-fast staining, individually, both the study and control group have shown significant differences in pre- and post-tests. The performance skill was assessed by direct observation. The study group perform significantly better after getting feedback from peers. Whereas the control group was not able to reach the performance as compared to the study group.

Table I.Checklist for Oral assessment

Questions (each carries 2 marks)
1.What type of staining is this?
2. Procedure of AFB staining
3. Principle of AFB staining
4. RNTCP grading
5. Another AFB organism?

Table 2.Checklist for practical assessment

Steps	Checklist	Timing	Marks
Step 1	Addition of Strong carbol fuschin	5min	1 mark
Step 2	3% Acid alcohol Decoloriser	2min	1 mark
Step 3	Add Loeffler's methylene blue	1min	1 mark
Step 4	Observe under oil immersion field /Inference	-	2 mark

Table 3.Comparison of results between pre-test and post-test of Study group

Statistical Analysis	Pre-test	Post-test
Mean	6.14	9.36
SD	2.11	1.44
SEM	0.35	0.24
N	36	36
The two-tailed P value is less than 0.0001*		
95% confidence interval of this difference: From -4.02 to -2.43		
*Significant difference in the formative assessment of study group in comparison Pre and Post-test. SD-Standard deviation, SEM-Standard error, N-Total no of participants		

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Table 4.Comparison of results between pre-test and post-test of Control group

Statistical Analysis	Pre-test	Post-test
Mean	6.06	10.43
SD	1.86	2.24
SEM	0.31	0.38
N	35	35
The two-tailed P value is less than 0.0001		
95% confidence interval of this difference: From -5.35 to -3.39		
*Significant difference in the formative assessment of Control group in comparison to Pre and Post-test. SD-Standard deviation, SEM-Standard error, N-Total no of participants		

Table 5.Comparison of Practical assessment results between Study and Control group

Statistical Analysis	Study group	Control group
Mean	8.83	7.54
SD	1.23	1.29
SEM	0.21	0.38
N	36	35
The two-tailed P value is less than 0.0001		
95% confidence interval of this difference: From 0.69 to 1.89		
*Significant difference in the performance of study group in comparison to Control group. SD-Standard deviation, SEM-Standard error, N-Total no of participants		

Discussions

In this study, Peyton's method was compared to the conventional "see one, do one" method for teaching undergraduate students. To determine the efficacy of Peyton's methods, the students' performance was measured objectively. Teaching procedural skills using the modified Peyton's methods has been demonstrated to be successful[8]. A modified version of Peyton's 4-step approach was utilised by Nikendei C et al to train a small group of students[9]. In our study the modified Peyton's approach with five steps was created by an expert team intended to be used in small group discussions. Modified Peyton's methods made acid-fast staining easier to engage every student in a group at once. Our finding showed that the performance of the study group is better compared to the control group. This modification's key step is to practise under peer supervision and feedback. In comparison to seeing one do one method, students' performance is better in the modified Peytons method, as they learn best when they switch between doing and observing a task. Medical literature describes the use of the modified Peyton's four-step approach in teaching difficult medical procedures[10,11]

The results of pre- and post-test questionnaires completed by students who participated in the acid-fast staining sessions showed that the modified Peyton's approach is an effective tool for teaching and learning. The result of this study is similar to a study conducted by Skrzypek A et al[12]. This method can be applied for training other procedural skills for students of medical school. Understanding and memorisation of the four-step process for learning staining procedures are aided by active participation, observation, repetition, and instructing other students. Each participant in the classes practised the procedure several times under safe settings as a result of the modified Peyton approach[12]. Efficiency of the modified Peyton's approach was measured using oral and practical assessment, where the study group performed better, which was statistically significant. In contrast to the study by Singhania A et al[7] a significant difference was not seen between the study and control groups. Though the results were significant, the sample size was rather small; further studies with larger sample sizes will pave a way to evaluate the efficacy of this method.

Conclusion

The outcome of this method is beneficial to both students and teachers, as per feedback provided by the students and tutors. Modified Peyton's technique, composed of five steps, is successful in teaching practical skills to students in small groups compared to the conventional "see one, do

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one" approach. The addition of repeated training under supervision and peer feedback encourages the students to understand and perform the technique effectively.

Authors Contribution:

V K B: Concept and ideas, Data Collection, PV A: Literature Review, V N S: Data Analysis, Manuscript Preparation

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