Original Article

Adaptation of Peyton's 4-step Approach Using Combined Video and Demonstration in Biochemistry Practical Phase I MBBS students at a Medical College in Western UP, India

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Abstract

Background: Medical education is shifting from traditional lectures to Competency-Based Medical Education, which emphasizes active, student-centred learning. However, Phase I MBBS students often struggle with biochemical laboratory techniques due to their abstract nature, limited practice opportunities, and passive teaching methods. Urine examination is a core CBME competency in Biochemistry with significant assessment weightage, yet traditional teaching often leads to poor skill retention and low confidence. Structured methods like Peyton's four-step approach can address this gap. Adapting this method will improve understanding, engagement, and skill acquisition in urine examination. **Material and Methods:** A prospective interventional study (Experimental educational approach) was done in the Department of Biochemistry, Mahatma Vidur Autonomous State Medical College, Bijnor (UP), India. 100 participants of Phase I MBBS students were selected by using randomization criteria and divided into two groups. Group A (Study Group) and B (Control Group), having 50 students in each group. Control group was taught urine examination using the traditional teaching method while study group was instructed using Peyton's four-step approach. Feedback was collected through tools like observational checklist and structured feedback questionnaire. Data was analysed using SPSS Version 2025. Categorical variables were presented as frequencies and percentages, while numerical data were expressed as mean ± standard deviation, p value ≤ 0.05 was considered statistically significant. **Results:** The control group had 52% of students who could do the benedict test, while the study group had 88% of students who could do the following skill sessions. The control group had 48% of students who could do the heat coagulation test, while the study group had 96% of students who could do the following skill sessions. In terms of students' self-confidence and satisfaction, 24% of those in the control group were very content and confident, whereas 88% of those in the study group were. There was a statistically significant difference in confidence levels between the two groups. A statistical difference was established between the control group and the study group when it came to the average and very good effectiveness of training. **Conclusion:** Students taught through peer-assisted learning using a modified Peyton's four-step approach demonstrated faster acquisition of skills, greater confidence, and higher competency in performing the Benedict's and heat coagulation test compared to those trained using traditional teaching methods.

Keywords: Peyton's Method, CBME competency, MBBS.

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Introduction

Surgeon Halsted came up with the "see one-do one" method in 1904, which has been used to teach procedural skills for a long time.[1,2] In this technique, the instructor first demonstrates and explains the procedure, after which the learner is expected to practice it. However, with the increasing complexity and diversity of clinical procedures today, many educators argue that this approach is no longer sufficient. Instead, it is suggested that the model should evolve to "see many, learn from the results and do many."[2] In response to these limitations, Rodney Peyton's four-step approach has gained recognition as an effective method for skills-lab training of technical procedures.[3,4] This structured method breaks down the learning process into four sequential, clearly defined steps.[5]

The four steps are:

Step 1 – Demonstrate: The trainer performs the skill at normal speed, without commentary, allowing the trainee to observe the complete procedure.

Step 2 – Talk the trainee through: The trainer repeats the procedure while verbally describing each sub-step in detail.

Step 3 – Trainee talks trainer through: The trainee instructs the trainer through the steps, reinforcing the learner's understanding while the trainer performs the procedure.

Step 4 – Trainee does: The trainee independently performs the

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entire procedure, applying the knowledge and skills acquired in the previous steps.

Peyton's four-step approach offers several significant advantages. In this method, the learner is required to think through the procedure in Steps 1 and 2 before articulating the instructions to the trainer in Step 3. This structured progression enables students to organize and consolidate their understanding before actively expressing it. Additionally, the cognitive process of self-explanation has been shown to facilitate the integration of new knowledge with pre-existing frameworks, thereby enhancing meaningful learning.[6]

Moreover, the approach naturally incorporates elements of peer learning, which plays an important role in clinical education. Positive peer interactions and supportive friendships are known to enrich the learning environment and improve skill acquisition among undergraduate students.[7] The goal of this experiment is to find out if Peyton's four-step method is better than traditional ways of teaching medical students' procedural skills and if the skills learned this way are better remembered over time.

Aim: The goal of this study was to see how Peyton's Four-Step Approach affected the performance of medical students compared to more traditional ways of teaching.

Objectives:

1. To evaluate the enhancement of students' procedural skills following the implementation of an adapted Peyton's 4-step approach in contrast to conventional learning methods among medical students.
2. To evaluate and contrast the levels of self-satisfaction and confidence among students in the study group and the control group.
3. To explore the faculty members perception of adapted Peyton's 4 step method for skill acquisition.

Materials and Methods

Study design: Planned interventional research (experimental educational technique).

Study Setting: Department of Biochemistry, Mahatma Vidur Autonomous State Medical College, Bijnor (UP), India.

Participants: Four faculty members and Phase I MBBS medical students got permission from the Institutional Ethics Committee. Group A (the study group) and Group B (the control group) each had the same number of students chosen at random.

Sample size: 100 medical students; Group A (Study Group) and B (Control Group) of 50 students in each group.

Sampling: By complete enumeration, we mean that everyone has the same chance of being put in any group. A lottery approach was used to choose pupils at random. The study duration was of six months.

Methodology: Students and faculty perspectives evaluation will be done by Likert scale questionnaire. To make sure that all of the faculties scored the same way, a common scoring checklist was established to examine the students' skills after the training session.

Description of Intervention (Control Group): The usual "see one, do one" method was used to teach the control group how to execute an abnormal urine test. In this method, the clinical instructor demonstrated the procedure once, providing a single explanatory demonstration. Following this, students were asked to perform the procedure independently (re-demonstration) while being supervised by the instructor.

Description of Intervention (Study Group): Using Peyton's four-step approach, which has four steps: Demonstration, Deconstruction, Comprehension, and Performance, each subgroup in the study group learned how to do the abnormal urine examination process.

The teacher did the whole process silently, at a normal speed, and without saying anything (Demonstration) during step 1. The instructor then did the same thing again, but this time he or she explained each step in depth (Deconstruction). The teacher did the technique for the third time at the third step. following the step-by-step instructions provided verbally by the students, ensuring that learners actively recalled and articulated the sequence (Comprehension). Finally, the students performed the procedure themselves, simultaneously demonstrating and verbalizing each step, thereby reinforcing understanding and skill acquisition (Performance).

In our study, we implemented blended learning, utilising video modules for steps 1 and 2 of Peyton's technique, followed by demonstrations for the subsequent two steps.

They can help to reduce the time and effort of the trainers, simultaneously enabling learners to go through the content repetitively, at a time of their preference, till they achieve clarity. Hence, we have adapted Peyton's 4 step for the present study. In this study, the following skill sessions were conducted: (1) Benedict's test for the detection of reducing sugars. (2) Heat coagulation test for the detection of proteins

Students' skill acquisition in both the control and study groups was assessed after performing each procedure, using a structured skills checklist.

To perform Benedict's test, students were instructed to take 5 mL of Benedict's reagent in a clean test tube and add 8-10 drops of the urine sample. The mixture was then gently mixed and heated for about two minutes using intermittent boiling. After heating, students observed the resulting colour change in the solution, which was interpreted based on the concentration of reducing sugar present: a green colour indicated approximately 0.5 g%, yellow indicated 1 g%, orange indicated 1.5 g%, and a brick-red colour indicated about 2 g% of reducing sugar.

To perform the heat coagulation test for the presence of protein, students were instructed to fill three-fourths of a test tube with the urine sample and heat only the upper one-third of the tube. After initial heating, 1-2 drops of 1% acetic acid were added, and the upper one-third of the test tube was heated again. The result was then recorded as either the presence or absence of coagulum, indicating the presence or absence of protein in the urine.

After doing the technique, both groups' self-confidence was measured.[8,9] The effectiveness of the course was assessed using a Likert scale.[9]

Table: Likert scale				
1	**2**	**3**	**4**	**5**
Never	Rarely	Sometimes	Often	Always
Completely disagree	Disagree	Neutral	Agree	Completely agree

We chose a structured questionnaire with 10 statements and a five-point Likert scale that spanned from strongly disagree (1) to strongly agree (5) to measure students' self-confidence and perception level. The more points you get, the more satisfied you are. The overall score was between "10 and 50." A score of 75% or more of the overall score meant "high satisfaction." A score of between 50% and 75% of the total score meant "moderate satisfaction," and a score of less than 50% of the total score meant "low satisfaction." It looked like this: low satisfaction (10–24), moderate satisfaction (25–37.4), and high satisfaction. (37.5-50).

Results

In the control group, 52% of students could measure blood pressure, while 88% of students in the study group could accomplish the following skill sessions [Table 1].

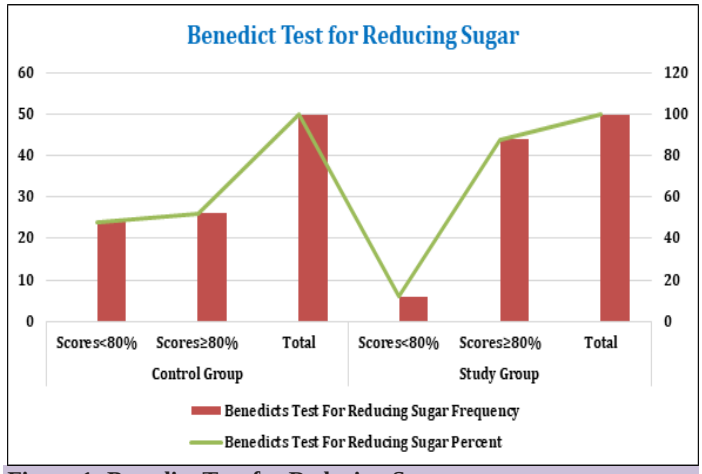

Figure 1: Benedict Test for Reducing Sugar.

Table 1: Benedict Test for Reducing Sugar (Procedure 1)

		Frequency	Percentage (%)	P value
Control Group	Scores<80%	24	48	0.005*
	Scores≥80%	26	52	
	Total	50	100	
Study Group	Scores<80%	6	12	
	Scores≥80%	44	88	
	Total	50	100	

Table 2: Heat Coagulation test for Protein (Procedure 2)

		Frequency	Percentage (%)	P value
Control Group	Scores<80%	26	52.0	<0.01*
	Scores≥80%	24	48.0	
	Total	50	100.0	
Study Group	Scores<80%	2	4.0	
	Scores≥80%	48	96.0	
	Total	50	100	

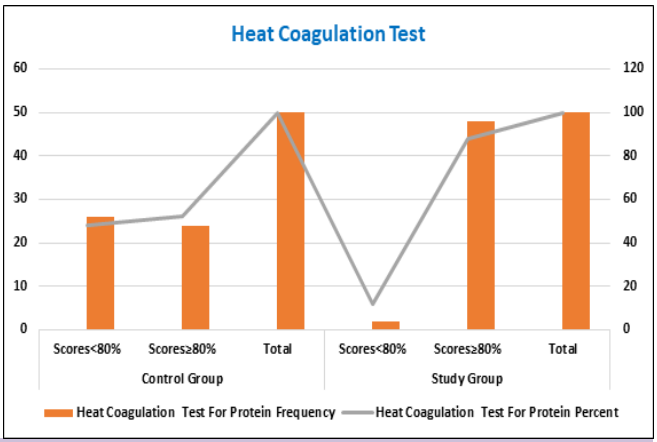

Figure 2: Heat Coagulation test for Protein

In the control group, 48% of students could measure blood pressure, but in the study group, 96% of students could conduct the next skill sessions [Table 2].

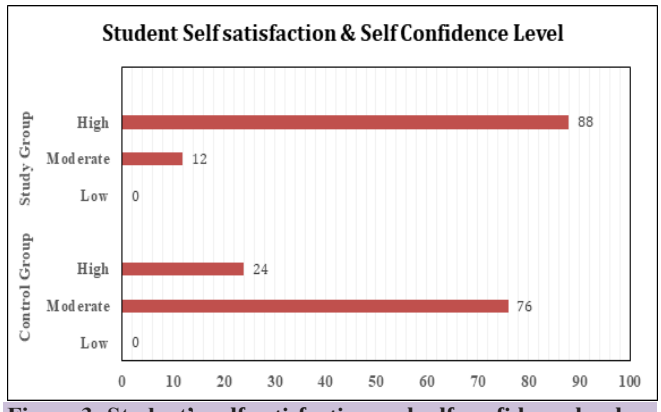

Figure 3: Student's self-satisfaction and self confidence levels

In terms of students' levels of self-confidence and satisfaction, 24% of those in the control group were very content and confident, while 88% of those in the study group were. [Table 3].

Table 3: Student's self-satisfaction and self confidence levels

Group		Frequency	P value
Control Group	Low	0	<0.01*
	Moderate	38	
	High	12	
	Total	50	
Study Group	Low	0	
	Moderate	6	
	High	44	
	Total	50	

Table 4: Effectiveness of training:

	Control Group		Study Group		P value
	Frequency	Percentage	Frequency	Percentage	
Effectiveness of training: Below average	6	12%	0	0%	
Effectiveness of training: Average	20	40%	2	4%	
Effectiveness of training: Good	18	36%	4	8%	<0.01*
Effectiveness of training: Very Good	4	8%	42	84%	

Table 5: Frequency Distribution as per Student perception of control and study group:

Student Perception	Control Group		Study Group	
Interest	4	4%	0	0%
Interactive	6	12%	0	0%
Time consuming	6	12%	0	0%
Understanding	18	36%	2	4%
Recall	6	12%	4	8%
Confidence	8	16%	42	84%

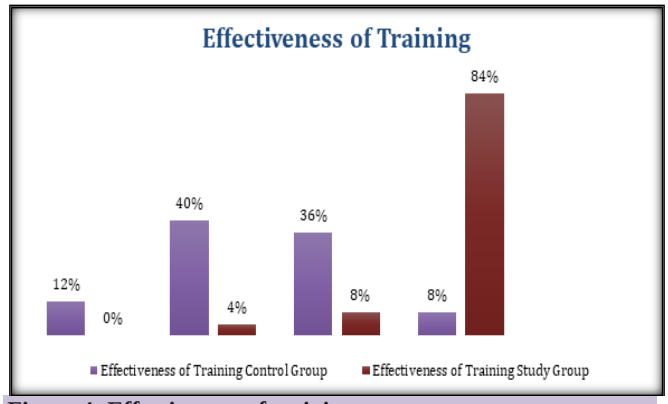

Figure 4: Effectiveness of training

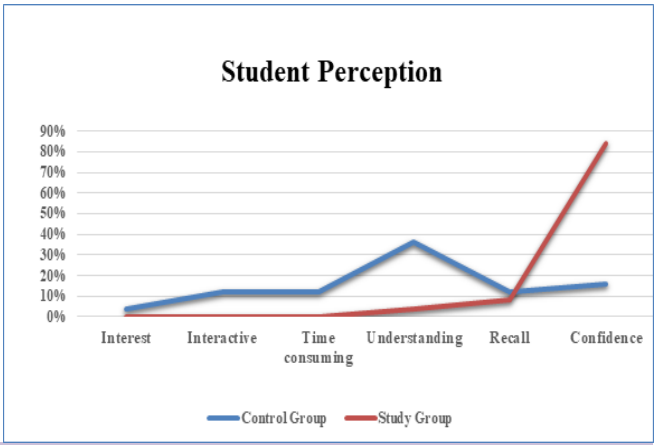

Figure 5: Student perception of control and study group

Evaluation of the faculty perception questionnaire revealed that 60% percent of faculty strongly agreed that Peyton's four-step approach was appropriate for teaching practical biochemistry skills. Video-based demonstration and deconstruction were found to be effective in promoting active learning, reducing teaching workload, and ensuring consistency among faculty. Eighty percent strongly agreed that live comprehension and performance steps enhanced student engagement and improved skill acquisition. Additionally, most faculty felt that the approach was feasible to implement within routine practical time limits and recommended its continued use for future batches.

Discussion

Peyton's method is a mix of several parts of the learning theory. It has four parts: demonstration, deconstruction, comprehension, and performance. Steps 1 and 2 are based on the social-cognitive learning theory, and step 4 is based on the behaviourists learning theory.[10] The purpose of this study was to compare how much better students' procedural skills got after using a modified version of Peyton's four-step approach compared to traditional learning. The students were tested on their ability to do the Benedict test for sugar and the heat coagulation test for protein. The students' self-satisfaction and confidence level in study group and control group was also compared in the current study.

In the control group, 52% of students could do the benedict test. In the study group, 88% of students could do the following skill sessions. In the control group, 48% of students could do the heat coagulation test according to the protocol, and in the study group, 96% of students could do the following skill sessions. Like our study, Mohammed AA et al. did a similar study with nursing students using a modified version of Peyton's four-step approach by peers. They said it was a new way of teaching that worked well for paediatric nursing students

right after they learned it, as they were better at doing neonatal CPR than students who learned in the usual way.[8] Sabaq AG et al. conducted a similar study that corroborated the efficacy of the peer teaching approach, evidenced by a significant enhancement in students' knowledge and performance scores. The authors noted that the majority of students in the study group experienced reduced anxiety, increased comfort, heightened self-confidence in teaching, and demonstrated improvement in their communication skills.[11]

In terms of students' self-confidence and satisfaction levels in the current study, 24% of the control group were satisfied and confident, whereas 88% of the study group exhibited similar sentiments, indicating a statistically significant difference in confidence levels between the two groups. A significant difference was observed between the control and study groups for the average and high efficacy of the training. Like our study, Mohammed AA et al. found that a modified version of Peyton's four-step technique helped students feel better about their performance.[8] Another similar study by Zentz SE et al. across two years with 342 students involved in peer-assisted learning found that sophomores reported lower anxiety and higher confidence as main benefits. A significant advantage for seniors was the opportunity to reflect on their professional development, which bolstered their confidence and eased their transition into the role of a professional nurse. Their study corroborated peer-assisted learning as an effective pedagogical approach for skill acquisition and the implementation of medical professional roles.[12] Within a peer-assisted learning framework, diverse roles for medical students can be cultivated, offering various challenges and advantages to participants.[13] The current study is limited by the utilisation of only two activities for the instruction and evaluation of skill acquisition. There should be additional activities to get more proof. Also, you should check your acquired skills again at different times to see if you still have them after a long time.

Conclusion

Students who learned from their peers using a modified version of Peyton's four-step strategy understood quickly, were more confident, and were better at the benedict test and the heat coagulation test than those who learned in the usual way. Reinforcement of practical biochemistry training using adapted Peyton's four-step approach effectively improved students' practical skills, confidence, and engagement in biochemistry. Integration of video-assisted and live demonstration steps enhanced learning consistency and faculty efficiency, supporting its wider adoption in pre-clinical practical training.

Limitations: The study had several limitations, including time constraints for faculty and a relatively small sample size drawn from a single institution, along with existing resource gaps. Additionally, the analysis was short-term with limited follow-up, which may not fully capture long-term outcomes. Variations in student engagement levels, as well as differences in mentor delivery styles and session timing, may also have influenced the consistency and overall effectiveness of the intervention.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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References

1. Halsted WS. The training of the surgeon. Bull Johns Hop Hosp. 1904:267-75.
2. Giacomino K, Caliesch R, Sattelmayer KM. 2020. The effectiveness of the Peyton's 4-step teaching approach on skill acquisition of procedures in health professions education: A systematic review and meta-analysis with integrated meta-regression. PeerJ 8:e10129 https://doi.org/10.7717/peerj.10129.
3. Herrmann-Werner A, Nikendei C, Keifenheim K, Bosse HM, Lund F, Wagner R, Celebi N, Zipfel S, Weyrich P. "Best practice" skills lab training vs. a "see one, do one" approach in undergraduate medical education: an RCT on students' long-term ability to perform procedural clinical skills. PLoS One. 2013;8(9):e76354.
4. Krautter M, Weyrich P, Schultz JH, Buss SJ, Maatouk I, Junger J, Nikendei C. Effects of Peyton's four-step approach on objective performance measures in technical skills training: a controlled trial. Teach Learn Med. 2011;23(3):244–50.
5. Peyton JWR. Teaching in the theatre. In: Peyton JWR, editor. Teaching and learning in medical practice. Manticore Europe; 1998: p. 171–80. 6. Ahmed FR, Morsi SR, Mostafa HM. Effect of Peyton's Four Step Approach on skill acquisition, self-confidence and self-satisfaction among critical care nursing students. IOSR-JNHS. 2018;6:38-47.
6. Ahmed FR, Morsi SR, Mostafa HM. Effect of Peyton's Four Step Approach on skill acquisition, self-confidence and self-satisfaction among critical care nursing students. IOSR-JNHS. 2018;6:38-47.
7. Ravanipour M, Bahreini M, Ravanipour M. Exploring nursing students' experience of peer learning in clinical practice. J Educ Health Promot. 2015;4:46. Published 2015 May 19. doi:10.4103/2277-9531.157233.
8. Mohammed AA, Mohammed NY, Ouda MM, Abu ElEla LA. Effect of peers' application of modified Peyton's four-step approach versus traditional learning on pediatric Nursing students' performance. Journal of Health, Medicine and Nursing. 2019 Dec 31;69:65-68.
9. Sullivan GM, Artino Jr AR. Analyzing and interpreting data from Likert-type scales. Journal of graduate medical education. 2013 Dec;5(4):541-2.
10. Naseem S, Fatima D, Ghazanfar H, Awan SA, Fatima DS. Four step approach by Peyton's as a tool for teaching SPSS among undergraduate medical students: An experience from Pakistan.
11. Sabaq AG, Farouk M, Ismail SS. Effect of Peer Teaching Versus

Traditional Teaching Method on Nursing Students' Performance Regarding Pediatric Cardiopulmonary Resuscitation. Tanta Scientific Nursing Journal. 2016 May 1;10(1):7-25.
12. Zentz SE, Kurtz CP, Alverson EM. Undergraduate peer-assisted learning in the clinical setting. Journal of Nursing Education. 2014 Mar 1;53(3):S4-10.
13. Hill E, Liuzzi F, Giles J. Peer-assisted learning from three perspectives: student, tutor and co-ordinator. The clinical teacher. 2010 Dec;7(4):244-6.