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# Four step approach by Peyton's as a tool for teaching SPSS among undergraduate medical students: An experience from Pakistan.

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***Abstract***
*Objectives: To compare the performance of medical students of year 4 in using Statistical Package for Social Sciences (SPSS) version 23.0 taught through Peyton's four step approach versus traditional teaching at Shifa College of Medicine (SCM), Pakistan.*
*Methodology: An experimental study including 100 students in Year 4 of SCM was carried out. Fifty students were exposed to Peyton's four step approach while the remaining 50 were taught through the regular teaching methodology practiced at SCM, serving as a control group. All students were assessed on their SPSS skill through a uniform examination. In the end, feedback was obtained from all students in terms of content, structure, presentation and overall satisfaction.*
*Results: Ninetyfour students completed the study. Mean score among the 4 step Peyton approach group was 3.83 ± 2.09 while the score in the control group was 3.03 ± 2.71. Independent samples t test was found to be statistically significant for mean scores. However, no statistical significance was seen in the feedback obtained from either group in terms of content, structure, presentation and overall satisfaction.*
*Conclusion: Students learn SPSS software better when taught through Peyton's four step approach as compared to traditional teaching. This approach should be utilized to help learners develop better understanding of the novel skills that students may find difficulty in learning through the traditional teaching method.*
***Keywords:****SPSS, Peyton approach four steps, Social Learning theory.*

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## I. Introduction

R. Peyton introduced a fourstep approach to learning practical skills. These four steps namely Demonstration, Deconstruction, Comprehension and Execution are employed to expedite skill training in students [1].

The methodology followed by Peyton's approach involves initially a demonstration of the skill by the teacher without an explanation. This is followed by deconstruction, which implies repetition of each step but with an explanation. Next, the student is required to recall each step whereupon the teacher performs as directed; lastly, the student performs each step independently, while explaining simultaneously [1].

Peyton's 4 step approach has been widely studied in order to determine its efficiency as an instructional method. Various studies in the past have shown it as superior to the traditional teaching methodologies, in skill training of students [2-6]. However, some studies have suggested no significant benefit of employing Peyton's approach in skill training [7-9].

While there are research projects determining the role of Peyton's approach in teaching of different clinical skills, the subject of its capacity in developing research skills has not sufficiently tackled. Therefore, our study aimed to explore the role of Peyton's approach in acquiring skills to effectively use Statistical Package for Social Sciences (SPSS) software, which can be used to improve statistical analysis of research projects. The study compared the performance of medical students of year 4 in using SPSS version 23 taught through the four step approach by Peyton's versus traditional teaching method at Shifa College of Medicine, Pakistan.

## II. Methods

A Randomized Controlled Trial involving 100 students of Shifa College of Medicine in Year 4 was carried out over a period of one year in 5 clerkships of Community and Family Medicine, Shifa College of Medicine, STMU, Islamabad. All students of Year 4 attending the SPSS training session in the Clerkship were enrolled in the study. Students of Year 4 SCM not attending the clerkship teaching session or not appearing in the clerkship examination were excluded from the study. Randomization of students to two groups was done using a computer generated table of random numbers.

The 'skill taught' was defined as using 2 windows of SPSS: Variable view and data view, along with saving the file by naming it on the desktop. The skill was practiced through entering one qualitative and one quantitative variable in the variable view as well as entering data of 30 subjects in the data view. (Data was provided). The duration of each session was 2 hours

One group (A) was exposed to Peyton's four step approach where: Step 1 – "Demonstrate": The trainer demonstrates the skill at a normal pace and without additional comments. Step 2 – "Talk the trainee through": The trainer demonstrates the respective skill while describing each procedural sub step in detail. Step 3 – "Trainee talks' trainer through": The trainer performs the skill for a third time, based on the sub steps described to him by the trainee. Step 4 – "Trainee does": The trainee performs the skill on his/her own. The other group (B) was exposed to the traditional method of SPSS Teaching. This was carried out in two steps: Demonstrating and explaining steps of data entry followed by asking students to enter the data.

The skill taught was assessed by asking the students to enter one qualitative and quantitative variable along with data of 10 subjects in the SPSS sheet in 7 mins, as per OSCE station practice in the clerkship exam. All students within one clerkship batch were provided the same task. However, the variable as well as the data was different for each clerkship batch.

Assessment of Skill: This was done using a pre designed checklist carrying 7 marks in terms of: entering the qualitative variable – 1.5 marks, entering the quantitative variable – 1.5 marks, entering the data for qualitative variable– 1.5 marks, entering the data for quantitative variable – 1.5 marks, saving the file – 1 mark.

At the end of the session, feedback of students was obtained using a structured proforma evaluating the content, structure and presentation of the session individually as well as overall session.

Approval from the Shifa International Hospital IRB Ethics Committee was obtained. Informed consent was taken from all participants of the study. Confidentiality of students' identification and performance was ensured.

The data was entered and analyzed using SPSS version 23.0. Descriptive statistics were calculated for both qualitative and quantitative variables. For qualitative variables frequency and percentage were calculated. For quantitative variables like students' scores, mean and standard deviation (SD) were calculated. Independent samples t-test was used to compare the mean score of both groups, keeping p value $< 0.05$ as level of significance.

## III. Results

94 students completed the study. Among these, 51% were male and 49% female.

Mean score of all the students was 3.43±2.4. Mean score among the 4 step approach group (group A) was 3.83 ± 2.09 while score in group B was 3.03 ± 2.71.

Independent samples t test was found to be statistically significant among mean scores between the two groups with $p < 0.05$. This is presented in Table1.

Using the Independent samples t-test, there was no statistical significance seen in the mean scores of males and females in both groups.

On evaluation of feedback, 51% students reported moderate satisfaction with the content of the session while 49% were highly satisfied.

There was a similar trend seen regarding feedback on the structure of the session where 1% participants were somewhat satisfied, 46.9% were moderately satisfied, while 52% were highly satisfied.

The presentation of the session was rated as somewhat satisfactory by 5.1% students, moderately satisfactory by 39.8% students and highly satisfactory by 55.1% students.

Commenting on the overall session: 2% participants were not satisfied, followed by 3.1%, 34.75% and 60.2% who were somewhat, moderately and highly satisfied respectively. This information is represented in Figure 1.

When chi-square test was applied to determine the difference in the feedback among both groups overall as well as in all the 3 different domains, no statistical significance was seen ($p>0.05$).

## IV. Discussion

Peyton's approach is a combination of various aspects of the learning theory. It is comprised of four steps including demonstration, deconstruction, comprehension and execution [1]. Step 1 and 2 are based on social-cognitive learning theory while step 4 is based on behaviorists learning theory [10].

Skill-lab training is now an integral component of medical curriculum worldwide. A study on medical students in China elucidated the benefit of simulation-based training of clinical skills such as thoracentesis in long-term retention of these skills [11]. Peyton's model involves simulation-based learning, thereby improving clinical practice in medical students trained with this approach.

A German study conducted on volunteer first-year medical students teaching intravenous cannulation. The study highlighted the superiority of clinical skills training at a skill lab using Peyton's approach as opposed to bedside teaching via traditional method. Once trained, each group of students was assessed in a clinical setting. The results revealed that students trained using the Peyton's approach required significantly shorter time to perform the skill and performed significantly more single steps of the procedure correctly [5].

The efficacy of Peyton's' approach is more pronounced in learning practical skills as opposed to theory. In a study conducted in 2016, two groups of medical students were taught principles of complex spinal manipulation skills each by Peyton's approach and conventional method of teaching. The participants were later assessed on theoretical knowledge by a multiple choice (MC) exam and practical skills by an Objective Structured Practical Examination (OSPE). The results revealed that while there was no significant difference in the performance between groups in the MC exam. However, students instructed through Peyton's four step approach did significantly well in the practical (OSPE) exam. This study also assessed retention of acquired skills in participants by taking an identical second practical exam six months later. Interestingly both groups showed a significant decline in the knowledge and competency to perform techniques [12]. This prompts the need for follow up examination to assess retention of skills acquired by Peyton's method. In our study a re-evaluation of learning outcomes was performed next morning which can be made more valid by increasing the time duration before re-evaluation of skills.

A randomized control trial in Germany on medical students evaluated gastric tube insertion in a manikin on two different groups. One group (IG) received instructions according to Peyton's Four-Step Approach while the other group served as a control receiving standard instructions (CG). The results revealed that Peyton's Four-Step Approach was superior to the standard teaching method with respect to professionalism and accompanying doctor–patient communication. Further, there was a statistically significant ($p < .001$) difference in the time needed for the first independent performance of the learned skill in the group receiving instructions according to Peyton's approach ($168 \pm 30$ s) as opposed to the control group ($242 \pm 53$ s) [4]. A similar trend was seen in our study participants.

Another study at the same institution investigated the differential learning outcomes of separate steps of Peyton's four-step approach. The study conducted on 3rd year medical students assessed successful learning of central venous catheterization using a manikin. The results identified Peyton's Step 3 as the most crucial step in determining positive learning outcomes. In this study medical students were assessed on the first independent performance of a central venous catheter (CVC) insertion using a manikin, followed by a free recall test the following day. The results revealed that Step 3 was the most superior in skill acquisition than the preceding steps [3]. In our study the individual role of each step of the Peyton was not assessed separately, which can further help streamline teaching methodologies.

In our study a significant majority (62.7%) of the students reported a high level of satisfaction with Peyton method, citing it well-structured and comprehensive. A descriptive study published in 2014 revealed a similar trend. It constituted a group of trainees learning intravenous catheter insertion, concluding that Peyton's model was rated as easy to comprehend and motivated them to be more keenly involved in the learning process when observed by expert raters [13]. In our study the participants receiving Peyton method felt confident in being able to independently practice the skills they learned while students who were taught via standard method were less confident about independently practicing the skill they learned over the course. This difference can be attributed due to increased trainees' attention and subsequent deliberate practice associated with Peyton's method.

In our study about 52.9% were highly satisfied with the structure of Peyton's method while 51% were highly satisfied with the content delivered via by this method. The participants were of the opinion that due to increase attention to the content they were better able to retain most of the information taught to them over the course.

As students who were taught via Peyton's approach have been found to be more clinically competent as compared to students who were taught via standardized approach. This difference can also be attributed to the crucial Step 3 of the Peyton's four step approach which involves teaching someone else. This step helps the student identify any mistake they are making and therefore result in early rectification of the mistake. This technique also increases the chance of correct performance [14].The immediate feedback helps the student to self-regulate their learning progress [15]. Self-regulated learning has been shown to be more superior in long term performance as compared to instructor-regulated approach [16].

## V. Recommendations

Faculty should be innovative in its methods of teaching skills like SPSS. Such skills are not only difficult to teach but also hard to grasp for the learners. Adding some innovation in the teaching strategies will help learners to grasp the idea better, though this requires more time and faculty.

Limitations

Only one activity was used for teaching and assessment of SPSS skill learning. More activities should be used to gather more evidence. Also, reassessment of acquired skills should be at multiple time intervals in order to assess the long term retention of skills.

## VI. Conclusion

Students learn SPSS software better when taught through Peyton's 4 step approach as compared to traditional teaching. By incorporating this model frequently in various practical skills training, students can comprehend and acquire new skills more effectively.

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**Table 1**: Mean score of Students (n=94) in the SPSS station in the OSCE Exam

| Group | Score (Mean ± SD) | p-value |
|---|---|---|
| **Peyton's Approach (n=47)** | **3.83 ± 2** | **< 0.05** |
| **Regular Approach (n=47)** | **3.03 ± 2.7** | |
| **Overall Score (n= 94)** | **3.43 ± 2.4** | **-** |

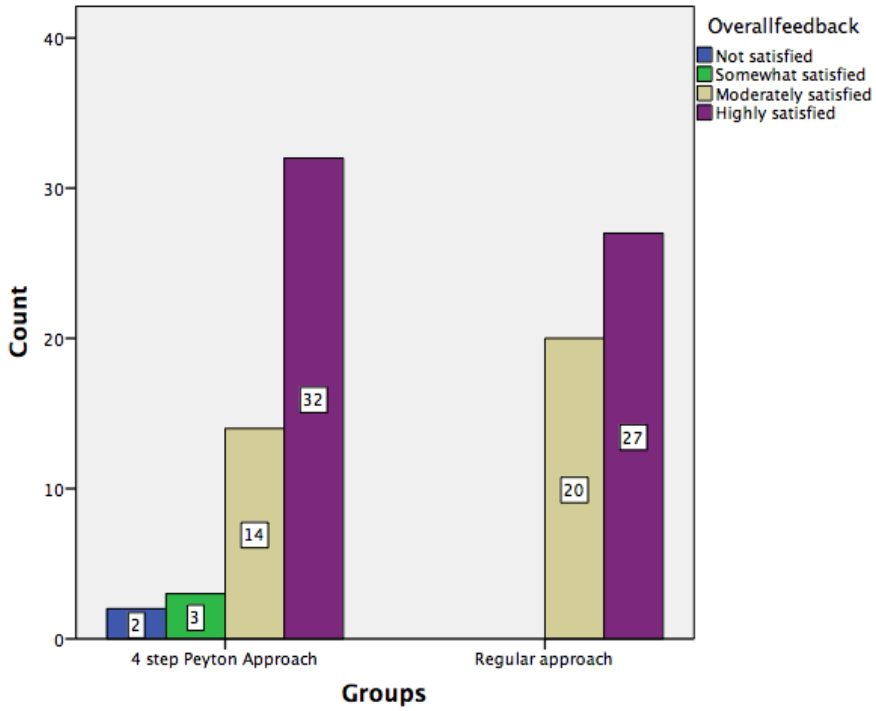


**Figure 1:** Bar chart showing Feedback of Students in both groups.

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