SHORT ARTICLE

Comparing the impact of three pedagogy exercises for popularizing positive deviance concept among medical students in Bareilly: A quasi-experimental study using normal curve approach

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ABSTRACT
Background: There is usually an apprehension fear among medical student and doctors about use of statistics in their academic study. **Objective**: This study aim to compare the impact of three teaching methods to popularize the concept of positive deviance (PD) through Normal curve theory among medical student. **Materials and Methods**: This quasi-experimental study was conducted over two months. 149 first-year MBBS students were divided into three groups, receiving different interventions. Kruskal-Wallis H test and Paired t test applied to see the statistical significance of intervention. **Results**: A Total 149 students during post-intervention assessments showed significant improvements ($p < 0.001$) in knowledge scores across all groups, with the Positive deviance (PD) approach demonstrating the most gains (Cohen's d=12.671). **Conclusions**: This study conclude that the implementation of the normal curve along with PD as a conceptual framework proven to be a significant technique which highlights the effectiveness of using Normal curve and PD concepts to make statistics easy for medical students.

KEYWORDS
Positive Deviance; Quasi-experimental Design; Educational Intervention; Medical Students; Statistics

INTRODUCTION
This study proposes to break this block/barrier by encouraging the medical student to use of statistics in their routine life/daily activity/discussion/thinking. This will help to demystify and simplify the seemingly/Apparently "complex" concept of Statistics.

In the context, we propose to use the simple concept of Normal Curve (NC) by integrating it with the concepts of Positive deviance (PD) (1). This PD approach for disseminative "new ideas and practices" has been employed in over 40 countries over the past two decades to address difficult social problems (2). Based on the NC theory, there will always be some data at the

extremes (2.5% on either side) of any statistical distribution (3). These are the outliers who exhibit wildly divergent (either positive or negative) results from the majority. Usually, we react to any idea/object/action as per its binary classification by us as NORMAL (95%) or NOT NORMAL (5%), such that OK or not OK. Thus, identification of "normal" and "non-normal" behaviour among the people can help us in adjusting behaviour change strategies accordingly. This will raise the likelihood of success (4). With this background, the study makes an effort to improve MBBS students' perspectives toward the subject of statistics using a PD.

The NC concept can also be used to teach /explain the following concepts:

- Leadership
- Management
- Individualization/customization
- Positive deviance
- Theory of innovation
- The Theory of Reasoned Action
- The transtheoretical model
- Diffusion of innovations
- Normal range of biochemical parameter in lab investigation etc.

Statistics is usually introduced in MBBS 3rd year. Often, they find it difficult to understand. Since our study aims to introduce this Statistics concept in MBBS (1st year), this will lay the foundation to prepare the students to grasp the concept of statistics more easily in 3rd year. It is expected that innovative strategy of this study will change the perspective of medical students towards the statistics as a subject. This endeavour is in tandem with the National Medical Commission (NMC) recommendation advocating innovations in teaching strategies (5).

Objectives

To compare the impact of three teaching methods to popularize the concept of positive deviance through Normal curve theory among medical student.

MATERIAL & METHODS

Study area: Shri Ram Murti Smarak Institute of Medical Sciences, Bareilly, Uttar Pradesh.

Study population: MBBS (1st year) students were included in the study.

Study duration: 01/09/2023 to 31/10/2023

Inclusion criteria: Enrolled as a MBBS student at institute and provided informed consent.

Exclusion criteria: Dropouts participants and who fail to complete survey.

Research design: Quasi-experimental, single group, before-after educational intervention.

Intervention Procedure: Total students divided into three groups i.e., A, B & C where two groups containing 50 students and one group having size 49 (excluding student who conducted this research/ICMR-STS award). All students were allocated randomly into 3 groups to reduce the variation due to assignable cause. Initially, at baseline basic statistics knowledge (School level) was checked through simple test included questions related to type of data, data representation, mean, median and mode, range, standard deviation etc. in all three groups. Following Educational interventions was done for enhancing students' knowledge.

Group A: Intervention through Expert-led educational seminar

Students attended a 2-hour seminar led by an expert on basic statistics and PD concepts.

Group B: Self-paced DVD/YouTube Video Shows Linked Flip Teaching for Group B

To facilitate engagement and maximize their learning opportunities a dedicated WhatsApp group for Group B students. The researcher played an active role in the WhatsApp group, offering regular motivational messages, progress updates, and reminders to watch the educational videos. After 7 days, students in Group B were assessed to measure the impact of the self-paced DVD/YouTube video shows linked flip teaching approach (6).

Group C: Positive deviance approach

Students showing the highest pre-intervention scores beyond the normal range ($\mu \pm 2\sigma$) helped their peers through peer learning. After 3 weeks post intervention test was taken to assess the effect of this Positive deviance approach.

Outcome variables: Knowledge score of students on Basic Statistical concepts like Measure of central tendency and Measure of dispersion and Normal curve. Satisfaction level of students with the learning experience

Sample Size: Complete enumeration system was used. Total 149 participants data was utilized for analysis.

Tool description: A structured questionnaire utilized in this study was measure the effect of intervention to assess basic knowledge of statistics/understanding of key concepts. It consisted of closed-ended and some open-ended questions, overall marks for the questions were 38. Before execution of survey, the questions were verified by an expert in the field to make sure its significance and validity.

Ethical approval: Permission from the Institute Ethics Committee on 21-08-2023 (Ref. No. SRMS IMS/ECC/2023/49) was taken for the study.

Data Analysis: Quantitative variable was analyzed through (Mean ± SD.) and qualitative categorical data was analysed through frequency and percentage. Normal distribution was utilized to check the status of positive deviance and approach opts to modifying their scores (-2σ to -3σ: 2.5%- More efforts need to motivate & +1σ to +2σ: 2.5%- Very less efforts needed & opt their approach to motivate others).

Kruskal-Wallis H test and Paired t test, Cohen's d effect sizes applied to see the statistical significance of intervention. Microsoft excel 2019 and IBM SPSS 27 used for analysis.

RESULTS

The interventional group-wise demographic characteristics of participants are provided in **Table 1**. The mean age of participants in Group A is 20.72 ± 1.62 years, in Group B is 20.48 ± 1.09 years, and in Group C is 20.64 ± 1.27 years, with an overall mean age of 20.61 ± 1.34 years.

Table 1: Demographic Characteristics of Intervention Groups A, B, and C (n = 149)

Parameters		Intervention Groups			Total
		A	B	C	
Age (in years)	(Mean ±SD)	20.72 ± 1.62	20.48 ± 1.09	20.64 ± 1.27	20.61 ± 1.34
Sex	Female	21 (42%)	27(55%)	24 (48%)	72 (48%)
	Male	29 (58%)	22 (45%)	26 (52%)	77 (52%)
Area	Rural	10 (20%)	8 (16%)	4 (8%)	22 (15%)
	Urban	40 (80%)	41(84%)	46 (92%)	127 (85%)
Total		50 (100%)	49 (100%)	50 (100%)	149 (100%)

Group A consists of 42% females and 58% male students, Group B has 55% females and 45% male students, and Group C has 48% females and 52% males.Regarding the area of residence, 20% of Group A resides in rural areas, 16% in Group B, and 8% in Group C. Further, Kruskal-Wallis test was applied to assess differences in the initial knowledge levels among the groups A, B and C assuming non-normality in baseline scores data (KS test: $p<0.01$)

H_0: There is no difference in median scores of group A, B and C.

H_1: There is significant difference in median scores of group A, B and C or at least two are differ.

The test results indicate that there is insufficient statistical evidence to reject the null hypothesis (H0), which suggests that there are no significant differences ($p > 0.05$) in baseline knowledge levels among the three groups. This means that, the groups appear to have similar baseline knowledge levels, and if variations observed in post-intervention knowledge can be more confidently attributed to the effect of the interventions.

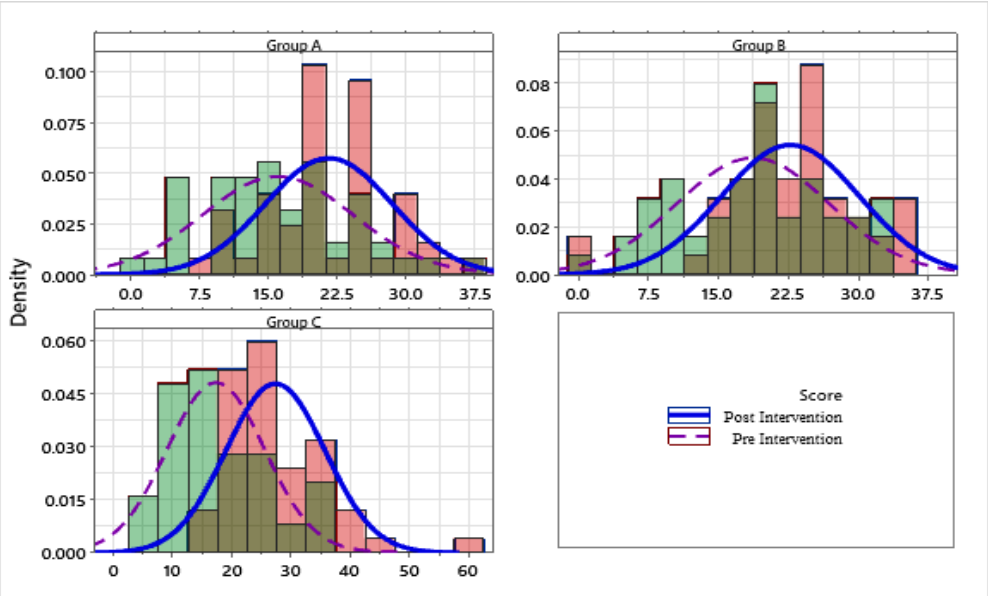
Further, Positive Deviance Students who achieve baseline scores that surpass the predefined normality limit of 33, which is calculated as $\mu \pm 2\sigma$, will be identified as positive deviants. There was 5 students having high-performance, scoring higher than the $\mu \pm 2\sigma$, will be actively encouraged to assist and guide their peers through a peer learning education strategy.

Impact of Interventions:

Figure 1 representing normal curves likely illustrate the distribution of scores within each group before and after the teaching

interventions. The shift of curve in post intervention suggests alterations in the distribution profiles due to the impact of interventions.

Figure 1: Altered Distribution Profiles Due to Impact of Teaching Interventions (N_A=50, N_B= 49, N_A= 50)



Moreover**, Table 2** represents the impact of three different pedagogical interventions on study participants, stratified into A, B, and C groups. In Group A, a statistically significant improvement was noted, with the mean scores increasing from 16.080 (8.253) pre-intervention to 21.560 (6.943) post-intervention (t = -14.407, df = 49, p < 0.001). Group B demonstrated a significant increase in mean scores from 18.510 (8.078) to 23.755 (5.854), by a significant t-value of -4.327 (df = 48, p < 0.001).

Similarly, Group C exhibited mean scores from 17.320 (8.272) to 27.300 (8.338), yielding a significant t-value of -5.569 (df = 49, p < 0.001). Furthermore, Cohen's d effect sizes of 2.690, 8.484, and 12.671 were observed for Groups A, B, and C, respectively.

Table 2: Impact of Pedagogical Interventions on Study Participant

Group	Pre Intervention		Post Intervention		df	t*	p value	Cohen's d
	Mean	SD	Mean	SD				
A	16.080	8.253	21.560	6.943	49	-14.407	0.000	2.690
B	18.510	8.078	23.755	5.854	48	-4.327	0.000	8.484
C	17.320	8.272	27.300	8.338	49	-5.569	0.000	12.671

**Paired t test*

DISCUSSION

In Group A, as evidenced by the mean scores rising from 16.080 ± 8.253 prior to the intervention to 21.560 ± 6.943 after it (t = -14.407, df = 49, p 0.001), is in line with research that shows how well expert-guided interventions work to clarify difficult concepts (7). A showed the value of seminar teaching techniques over lecture-based learning (LBL) in medical education, this intervention had a favorable influence on their learning (8).

However, in Group B improvement in mean scores from 18.510 ± 8.078 to 23.755 ± 5.854 with a significant t-value of -4.327 (df = 48, p<0.001) indicates the effectiveness of multimedia resources. This is consistent with research that highlights improved engagement through multimedia interventions (9, 10). According to research by Nouri et al. (11), a sizable majority of students valued the use of video (4.15 ± 1.10), the flexibility and mobility provided by the flipped classroom model (3.95 ± 1.10), the ability to learn at one's own pace

(3.75 ± 0.91) of the flipped classroom approach, the use of Moodle, and the use of video resources.

The effect of individual qualities, such as moral foundations and shifting of responsibility, was also explored in a behavioural study of obedience in health professional students (4). This was similar to the findings of our own research, which has the similar concept of studying positive deviance. Recently, there has been an increase in the number of instances in which peer-assisted learning (PAL) has been incorporated into the fundamental medical curriculum. The findings of the present study, a increment in mean scores from 17.320 ± 8.272 to 27.300 ± 8.338, yielding a significant t-value of -5.569 (df = 49, $p < 0.001$),which found that groups that had PD students who motivated and helped group members learn statistics by amplifying their PD behaviours to benefit their peers, contributed to a more encouraging and collaborative learning environment, are similar to the findings of study, significant improvement in the academic performance of medical students who received PAL compared with those in the control group (SMD = 0.52 (95% confidence interval 0.18–0.85); p = .003) who came to the conclusion that medical students who received PAL have significant advantages in terms of their academic performance in comparison to those who did not receive PAL (6). A study conducted by Triatmaja NT et.al. that the positive impact of three different pedagogical interventions on study participants, which were stratified into A, B, and C groups, the findings of this meta-analysis (12) indicate that interventions with a positive deviance approach have the potential to improve the overall health of minors under the age of five which is align with this study Abu Farha Ret.al (14). The benefits of Positive Deviation can be determined through a systematic review that emphasizes Positive Deviance in health and medical research, focusing on individual-level outcomes

Conclusion

The study concludes that Positive Deviance concepts in medical education significantly enhance students' understanding of statistics, particularly when involving peer-led interventions. This approach can be a valuable tool for overcoming the typical challenges associated with healthcare as well as academic problems. It can provide medical students with the necessary abilities to recognize and derive insights from individuals who achieve exceptional outcome

Recommendation

There is a need to formulate policies that target the improvement of academic practices through novel interventions. Policy should centred on innovative educational methods, digital resources, promotion of group learning and prioritize positive deviance concept which gives health professionals constant specialized improvement, which is critical for advancement of public health education and workforce capacity.

Limitation of the Study

Due to time constrained, this study utilized limited sample size and short duration of intervention.

Relevance of the Study

The study promotes an awareness of positive deviance concept, which helps shape a mindset among medical professionals that Encourages proactive, inventive, and evidence-based methods to addressing healthcare as well as academic problems.

Authors Contribution

All authors have contributed equally.

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Conflict of Interest

None

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Declaration of Generative AI and AI Assisted Technologies in the Writing Process

The authors haven't used any generative AI/AI assisted technologies in the writing process.

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