

RESEARCH ARTICLE

INTRODUCTION OF PROBLEM BASED LEARNING IN MICROBIOLOGY TEACHING TO UNDERGRADUATE STUDENTS

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Manuscript Info

Abstract

Manuscript History

Received: 28 November 2022 Final Accepted: 30 December 2022 Published: January 2023

Key words:-

Problem Based Learning, Microbiology, Medical education, PBL in Microbiology **Background:** Problem Based Learning [PBL] is one of the approaches which use learning material to help students learn, and apply knowledge.

Objectives:1] To develop and implement PBL. 2] To compare performance of second year MBBS students exposed to PBL and lecture-based learning.3] To collect feedbacks and analyses the perception.

Methodology: Second year MBBS students who gave consent were enrolled in this study. In total 4 groups of 8 students each were formed. One group was taught by the traditional learning approach; while problem-based learning was conducted for the other 3 groups on the same topic. At the end of sessions, the performance of the all the groups was evaluated by Post-test. The perception of students towards PBL was obtained through feedback

Result: The post test score among PBL groups students were higher as compared to Traditional Lecture based group students. The PBL experimental and traditional lecture control groups differed in their mean post-test scores (P < 0.05), wherein the PBL group showed higher scores than the Traditional Lecture group. In present study, 100% Students believed that PBL helped the students to clear basic concepts of microbiology and 91% felt that PBL improved their self-study skills.

Conclusion: PBL is effective teaching method in comparison to traditionallecture based teaching method.

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Introduction:-

Medical Education by traditional learning approach has focused on passing new knowledge to large group of students. It does not provide chance to analyze, evaluate, think, and understand application of knowledge. Students have become familiar with this process of passing knowledge, without inquiring into how this information applies to the working situations.¹

Corresponding Author:- Dr. Swetaben B. Prajapati Address:- Professor & Head Microbiology Department, GMERS Medical College, Vadnagar, Gujarat, India 384355. PBL is one of the approaches of medical education in which there is a way of using learning material to help students learn, and apply knowledge and give them opportunity to improve communication skills.PBL is challenging because it requires the teacher to use facilitating and supporting skills rather than giving them instructions and directions.^{2,3}

As per Jie sun et al study, PBL created a stress free and relaxed learning environment, learning through different cases helps them on the integrating and application of basic medical science knowledge, train their clinical diagnosis thinking and clinical reasoning ability and also enhance training capability of experienced tutors or staff.⁴

This educational experimental study was conducted in Microbiology department at GMERS Medical College, Vadnagar, and included students of second year MBBS

Objectives:-

1] To develop and implement PBL module

2] To compare performance of second year MBBS students exposed to problem-based learning and lecture-based learning.

3] To collect feedback and analyze the perception of second year MBBS students for problem-based learning in Microbiology teaching.

Methodology:-

The educational experimental study was conducted in the department of Microbiology at GMERS Medical College, Vadnagar, December 2020 to October 2021 after the approval of the Institutional Ethics Committee (IEC).

The students of second year MBBS were enrolled for the project those who gave the consent to participate were included for the project. The students were divided into small groups of 8 students per group per sample size calculated using effect size of PBL.⁵ Students were divided in to high, medium & low achievers group based on performance in Internal exam. Students were allocated to four groups as per sequence of Roll no from each of the three group. Total 32 students were enrolled.

All the students and faculties were sensitized for group dynamics.

Total 4 PBL modules were prepared on topic of Malaria (Module-1),Enteric fever (Module-2), Cholera(Module-3), and HIV(Module-4). All the students and faculties were sensitized for group dynamics. Randomly three groups of students were go into PBL sessions and one control group taught by traditional lecture methodon the same topic.

The 7 PBL-Step-Model of Slovene Association of LSP Teachers, Guide to Problem-Based Learning was used for Teaching Problem based Learning. All the students were sensitized for PBL method of learning. Each group had a "facilitator" who acted as a guide.⁶ Facultieswere sensitized for being "facilitator". Triggers were presented to students in the form of scenarios, diagnostic results, video and slides, and portions from the records of hospitalized patients by the facilitator to simulate real life scenarioduring PBL sessions.

At the end of sessions, the performance of the all the groups was evaluated by Post-test by peer reviewed Structured oral viva.Results were reported as average and number.The T test, Levene's F test, and ANNOVAtests were used to compare variables between groups. A P value of less than 0.05 was considered statistically significant

The perception of students towards PBL was obtained through validated feedback questionnaire on 3-point Likert scale and analyzed.



Figure 1:- Outline of methodology.

Results:-

Table 1:- Post test score among PBL and Traditional lecture group.

	Post test score				
	PBL	PBL			
	Group-1	Group-2	Group-3	Average	Group-4
Module-1	52	44	43	46	27
	Group-1	Group-2	Group-4		Group-3
Module-2	79	80	81	80	48
	Group-1	Group-3	Group-4		Group-2
Module-3	93	92	88	91	78
	Group-2	Group-3	Group-4		Group-1
Module-4	78	67	81	75	56

As per Table-1, The post test score among PBLexperiment groups students are higher as compared to Traditional Lecture based control group students.

Table 2: - Mean and Standard deviation of Post test-score of PBL and Traditional Lecture g	grou	ıр.
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Groups	Ν	Post test scores				
		MODULE 1	MODULE 2	MODULE 3	MODULE 4	
		Mean+SD	Mean+SD	Mean+SD	Mean+SD	
PBL Experimental	24	18+0.71	19+1.41	15.75+3.18	8.25+3.89	
Traditional	8	14+2	9+0	8+1.41	2+0	
Lecture Control						
Group						

As per Table-2, A T test was used to compare Mean post-test score values among PBL experiment and Traditional Lecture control group. A T test showed a significant difference P < 0.05 in the mean post test scores of the PBL Experimental (n=24) and Traditional Lecture Control (n=8) group.

Prior to conducting Annova, the assumption of normality was evaluated and determined to be satisfied as the students enrolled across four groups where associated with skew and kurtosis less than 2.0 and 9.0 respectively.⁷

	Module 1	Module 2	Module 3	Module 4
Number	31	32	32	32
Mean	6	14	13	16
SD	3	4	1	3
Skewness	0	-1	1	0
Kurtosis	-1	0	-1	-1

Table 3: -Descriptive statistics of students enrolled across the PBL and Traditional Lecture learning groups.

The descriptive statistics associated with students enrolled across the PBL and Traditional learning groups are reported in table 3

The assumption of homogeneity of variance was tested and satisfied based on Levene's F test, Module-1, F (3,28), p=0.211, Module-2, F (3,28), p=0.444, Module-3 F (3,28), p=0.06, Module-4 F (3,28), =5.916, p=0.444.

The independent between group ANNOVA gives statistical significant result among three out of **4 modules**, Module-2, F (3,28), =12.006, p=0.000, Module-3 F (3,28), =10.80, p=0.000, Module-4 F (3,28), =5.916, p=0.003

Sr. No.	Question	3	2	1
		[Agree]	[Neutral]	[Disagree]
1	PBL helped me in clearing basic concept	32 [100%]	0	0
2	PBL has motivated me for self-study	29 [91%]	3[9%]	0

3	PBL has improved my communication skills	30 [94%]	1[3%]	1[3%]
4	PBL has inculcated and improved my analytical skills	25[78%]	6[19%]	1[3%]
5	PBL helped me in retention of the subject topic and its	30[94%]	2[6%]	0
	clinical application			
6	PBL has made the topic interested	31[97%]	1[3%]	0
7	PBL helped increase my attention in the class	23[72%]	9[28%]	0
8	We interact more with teachers in PBL	32 [100%]	0	0
9	Learn to work together	29[91%]	2[6%]	1[3%]
10	PBL has worked as an effective learning tool for me.	27[84%]	5[16%]	0
11	Time of session is adequate	22[69%]	10[32%]	0

As per Table-4, 100% Students believed that PBL helped the students to clear basic concepts of microbiology and 91% felt that PBL improved their self-study skills. 100% students felt that PBL improved interaction with faculty.

Discussion:-

The present study is conducted to implement PBL module in microbiology department and to compare the effect of PBL with traditional lectures method on post test score in undergraduate second year MBBS students.

In present study, post test scores of PBL session are higher comparison with traditional lecture based teaching session. The PBL and traditional lecture groups differed in their mean post-test scores which shows significant difference by T test (P < 0.05), which suggest that PBL is effective teaching method in comparison to traditional lecture based teaching method. Students appear to learn better by their active involvement in the PBL teaching method. As a result, they scored higher.

In present study, the post test score difference between in 4 modules, PBL experimental and traditional lecture based group control group, among groups and within groups is statistical significant as per ANNOVA.

In present study, 100% Students believed that PBL helped the students to clear basic concepts of microbiology and 91% felt that PBL improved their self-study skills. 100% students felt that PBL improved interaction with faculty. 97% believe that PBL made the topic interested and 94% helped students in retention of the subject topic and its clinical application

In the present study, triggers are presented to students in the form of scenarios, diagnostic results, video and slides, and portions from the records of hospitalized patients by the facilitator to simulate real life scenario. Triggers are used to stimulate and recall situations which leads to more thoughtful and deeper involvement and also make topic more interesting.

PBL was a better teaching and learning tool in microbiology in comparison to traditional lecture based learning as also as shown by MAA Majumder et al.⁸, Abhraham et al.⁹, Hmelo-silver CE.¹⁰studies

Ram LochanYadav et al study¹¹, showed that 85.5% participants agreed that PBL is an interesting method of teaching learning. Most of them (86.7%) accepted that PBL is an interactive and a mutual learning method and improves self-directed learning (83.2%).

As per Alexander JG, McDaniel GS, Baldwin MSet al study New teaching methods, especially PBL, help improve self-direction and evidence based learning.¹²

In PBL method, increasing the level of participation of learners provide a better ground for thoughtful relationships, which leads to more sustainable learning. Therefore, students can have a deeper understanding of educational resources by using their power of reasoning and judgment in the topics. Hence, all the mentioned causes have been involved in strengthening the effectiveness of PBL teaching method in comparison with the lecturing method.¹³

According to Biley and Smith, perceptions of students trained using the PBL approach fall into three themes: 1. Understanding the true importance of everything; 2. Achieving the required knowledge; and 3. Familiarity with the process of change in teamwork. These three themes in PBL lead to familiarity and applying self-directed learning (SDL).¹⁴

Conclusion:-

PBL is effective teaching method in comparison to traditional lecture based teaching method. PBL as one of the methodologies of teaching help the students to learn better, clear their basic concepts, improves self-study skills and communication skills. Students interacts more with teachers. Also PBL made the topic interesting as it relates with real life scenario.





Acknowledgement:-

We would like to thank Institutional Ethics Committee of GMERS Vadnagar for providing permission of this study. Utmost gratitude to microbiology department faculty members for their effort during the study period. We are also acknowledging the support of students who gave consent to participate and also a special thanks to our Dean, Dr. HimanshuJoshi and Dr. Sanjay Mehta, HOD Microbiology C.U. Shah Medical College Surendranagar Gujaratwho are always helpful.

Limitation of study:

Conflict of Interest: None declared.

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